The Shape of Emergent Technology in the SA Mobile Telecommunications Sector

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Contents

Abbreviations

GSM	Global System for Mobile communication
ICASA	Independent Communications Authority of South Africa
ICT	Information & Communications Technology
IP	Intellectual Property
KPI	Key Performance Indicator
MNP	Mobile Number Portability
MP	Market Pull
R&D	Research and Development
TCP/IP	Transmission Control Protocol/Internet Protocol
TP	Technology Push

Glossary

Disruptive Innovation - An innovation that is financially unattractive for the leading incumbent to pursue, relative to its profit model and relative to other investments that are competing for the organisation's resources (Christensen, 2006).

Eigen-Value - The EigenValue for a given factor reflects the variance in all the variables, which is accounted for by that factor. A factor's EigenValue may be computed as the sum of its squared factor loadings for all the variables.

Enabling Technologies - are technologies that enable new degrees of freedom in the development of products that did not previously exist. An example is the Internet which enabled a new level of communication.

Enhanced Data Rates for GSM Evolution (EDGE) - is a digital mobile phone technology that allows for an increase in data transmission rate and improved data transmission reliability.

Explicit knowledge - "Explicit or codified knowledge… refers to knowledge that is transmittable in formal, systematic language" (Nonaka & Takeuchi,1995)

General Packet Radio Service (GPRS) - is a mobile data service available to users of GSM and AMPS mobile phones. GPRS data transfer is typically charged per megabyte of transferred data, while data communication via traditional circuit switching is billed per minute of connection time, independent of whether the user has actually transferred data or has been in an idle state. GPRS can be used for services such as WAP access, SMS, MMS and for internet communication services such as e-mail and World Wide Web access.

Knowledge Management - Knowledge comprises data, information and tacit knowledge and that knowledge management is the management function that creates or locates knowledge, manages the flow of knowledge within the organisation and ensures that the knowledge is used effectively and efficiently for the long-term benefit of the organisation.

Market Pull (MP) - suggests that the trigger for innovation comes from the needs of a particular section of the market.

Mobile Broadband Services - is the name used to describe the 3G services which are made possible by HSDPA and HSUPA, the latest technologies on the Wideband CDMA evolutionary path.

Mobile Number Portability (MNP) - A subscriber can be migrated to any network provider and is able to retain his/her mobile contact number.

Mobile Termination Rate (MTR) - The amount of funds that network providers pay each other for calls terminating on their respective networks.

Network Provider - Organisations in the mobile telecommunication industry that are providing data and Voice communication services, viz. Vodacom, MTN, CellC, Virgin Mobile, Telkom Mobile.

Private Automated Branch Exchange (PABX) - this telephone network is commonly used by call centres and other organizations. PABX allows a single access number to offer multiple lines to outside callers while providing a range of external lines to internal callers or staff.

Radical Innovation - is an innovation generally containing new technologies, which significantly changes the consumption patterns in the marketplace

Tacit knowledge - Tacit knowledge is personal, context-specific and therefore hard to formalise and communicate (Nonaka & Takeuchi, 1995)

Technology Development - is the set of activities beginning with the discovery and experimentation of the technology and ending with the development of the technology sufficient for its use in products and applications.

Technology Push (TP) - is product development where the realization of a product through embodying a specific technology in a manner meant to satisfy customer needs takes place.

Worldwide Interoperability for Microwave Access (WiMAX) - is a telecommunications technology aimed at providing wireless data over long distances in a variety of ways, from point to point links to full mobile cellular type access.

Voice Over IP (VOIP) - Voice communication performed over the internet Protocol.

Wireless Fidelity (WiFi) - is a term for certain types of wireless local area IP networks (WLAN) that use specifications in the 802.11 family.

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Chapter 1 - Orientation

1.1 Introduction

This study postulates that the current incumbents in the SA mobile telecommunications industry are still relying on old working mobile technologies even though new types are emerging within the industry. One can further argue that established incumbents develop an over -reliance on proven technology that impacts on its ability to explore other growth options and maintain market leadership. In many industries, it is doubtfully believed that an organisation's growth options rested upon tried and true strategies, current technology and other best practices that are "proven" to drive results. And why shouldn't they be? They were effective in the past and are associated with the current status quo, however the creation and sustenance of competitive advantage now is not only about playing the existing rules of the game well enough, it is about continuously changing those existing rules of the game in order to gain the advantage.

1.2 Orientation

The introduction of mobility in telecommunications in 1994 marked the start of an era where technology was, and arguably still is the primary driver of change in the industry. The sector has evolved into a constant state of technology flux that has seamlessly triggered some changes in business management and its associated practices. The onset of rapid globalization and the blurring of the boundaries between functions, technologies, departments, companies, industries and even countries have now surfaced. This new technological dimension now potentially creates additional pressure for industry occupants to focus on strategic and operational planning to achieve future organisational growth and profitability.

In high technology industries, such as the SA Telecommunications arena, the external acquisition of new technology plays a vital role in any product development process. There is an added element of pressure to reach quick-time-to-market which has a tendency to contribute to the importance of new technology acquisition. The presence of being a leader or follower in the market now arises, where matching the

appropriate technology with a particular product is viewed by some as imperative to sustaining the competitive gap.

The telecommunications industry is undergoing radical changes of its own; some examples include global liberalization of trade and investment in telecommunications, as well as national deregulation and privatization. Thus, SA telecommunications businesses are facing a double dilemma: while the telecommunications technology and industry are being rapidly redefined, the markets are being opened to local and global competition.

Competition has played an important part with regards to the introduction of new technology in the telecommunications industry e.g. South Africa was the first country in the world to introduce the prepaid system. Pioneers of the industry still find it hard to believe the rate at which mobile communication was adopted by the population. Over time the industry has been liberalised and is now regulated by the Independent Communications Authority of South Africa (ICASA), mainly through the 2 Electronics and Communications Act, 2005 (Act No. 36 of 2005), whilst the Competition Act, 1998 (Act No. 89 of 1998) and the Constitution are also sometimes used to resolve disputes as they arise.

Consumers have long been subject to some of the highest mobile interconnection rates in the world. Despite having already been in business for over a decade, in 2001, when the entry of the third mobile competitor entered the market, the incumbent mobile operators increased their asymmetrical mobile termination rate from 20 cents to R1.25 – a rise of over 500% – while the fixed termination rate was set at 27 cents. Only until recently has the interconnection rates been under the spotlight with ICASA (Independent Communications Authority of South Africa) enforcing the reduction within the industry. The regulatory framework, however, is currently uncertain in a number of respects. Many of the regulations and other secondary legislation required to fulfil the implementation of the Electronic Communications Act are still pending or not yet proposed. In line with the provisions of the Act, ICASA has instituted a number of processes that have either stalled or not reached conclusion.

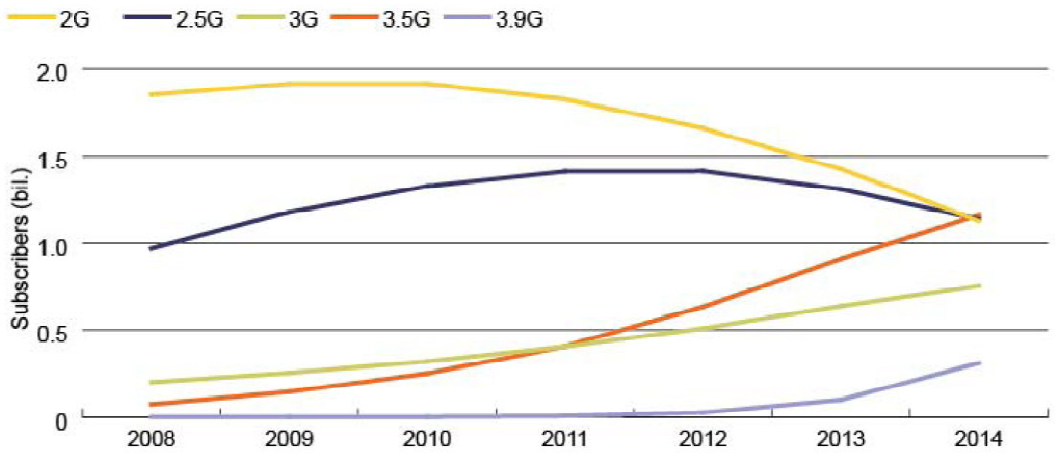
From the customer perspective the following communication based examples are driving the introduction of new technologies in the ICT industry:

- Quadruple play services (integrated or converged voice, data, video and mobility).
- Hyper-connectivity – The state in which the number of devices, nodes and applications connected to the network far exceeds the number of people using the network (Nortel 2007).
- The need for "Always on, anywhere and anytime" broadband connectivity.
- QoS (Quality of Service) in order to provide a certain guarantee on the performance of the service in terms of bandwidth, throughput, latency and availability of the service.
- New charging and pricing models which include transparent charging models for services, a single bill for all ICT and media related services and more affordable pricing models making use of LBC (Location Based Charging) thereby making the cost per second or bit more affordable.
- Customisation and personalisation.
- Web 2.0, social networking, interactivity and services such as online gaming.

Although mobile services continue to grow, challenges remain around universal access and particularly usage. While growth in mobile has greatly increased voice access, there has been little policy intervention to address usage issues, as a result of pricing. Pricing remains one of the major barriers to the access and usage of both fixed-line and mobile phone services. In addition, the cost of equipment such as Internet-enabled mobile phones and personal computers are prohibitively high as is the cost of accessing services, which has limited growth in the uptake of data services.

Figure 1-1 below depicts the evolution of mobile telecommunications, where 2G represents the 2nd generation, namely the introduction of data GPRS (General Radio Packet Service). The evolved 3.9G represents the use of LTE (Long Term Evolution) types for increased bandwidth requirements and the growing demand for fast data downloads speeds.

Figure 1-1: New generation Adoption Rates



Source: Informa Telecoms & Media (2011)

The 4th generation of mobile communication will be a combination of various technologies that offers user connectivity to the Internet at any place and at any time with high speed connectivity (Figure 1-2). This generation is expected to be a cost effective infrastructure, that offers enhanced services and increased security as compared to its previous generation (3G).The technology will provide 100 Mbps (Mega Bits per Second) data rate globally between two users anywhere in the world. The main function of 4G will be the integration of present technology to function with each other within a new interface. It will offer 100 Mbps for moving mobile communication and one Gbps (Giga Bit per Second) for fixed communication. With these kinds of speed & bandwidth and the combination of major wireless technologies, incumbents and new entrants have an interesting future ahead.

Figure 1-2:Telecom Evolution

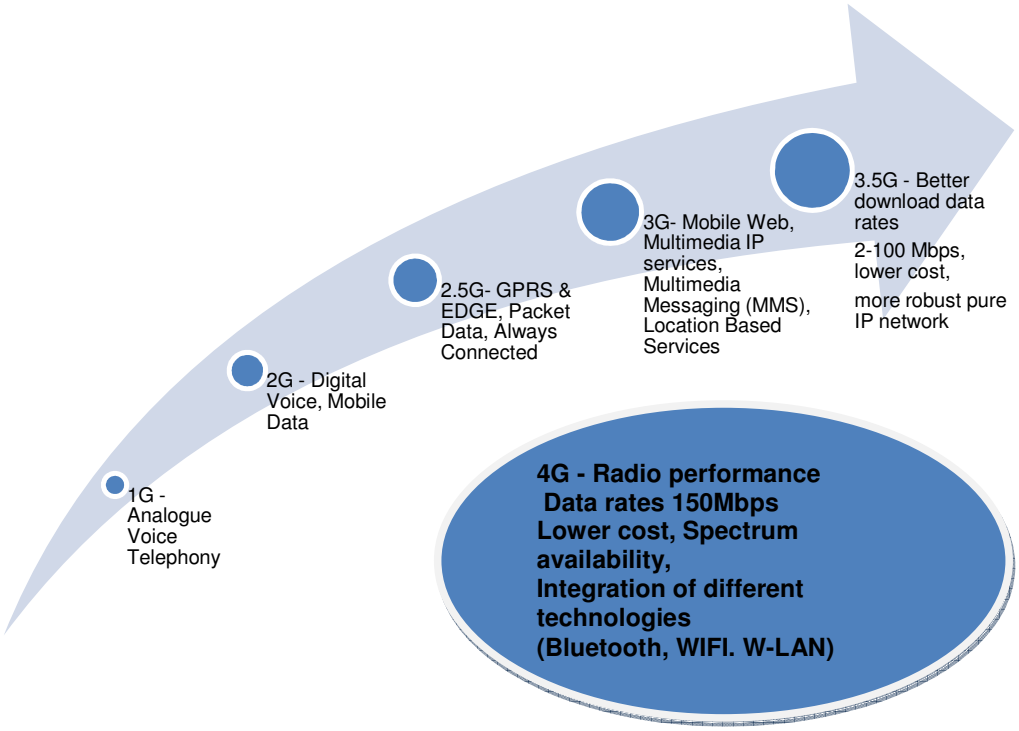
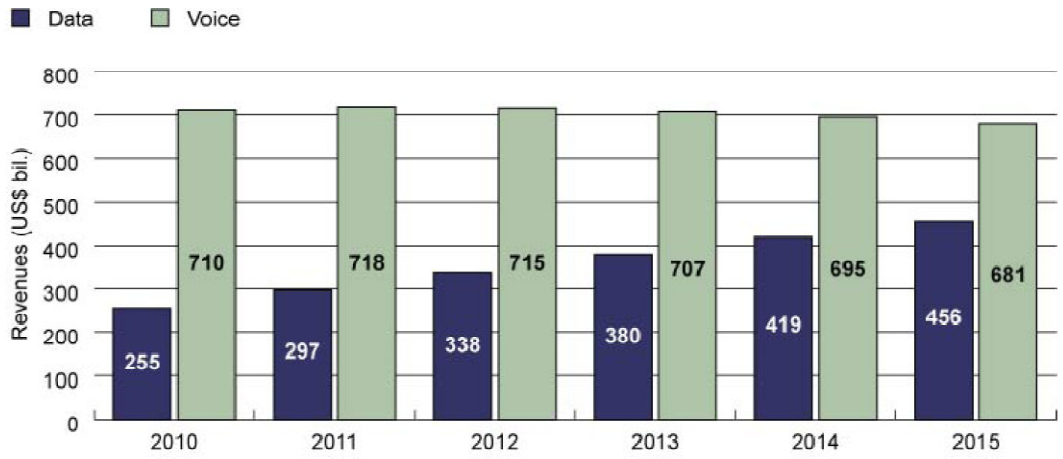


Figure 1-1 highlights three very fundamental concepts, (1) Mobile communications technology has the potential to evolve at a phenomenal rate, (2) Judging from the adoption rate, the pricing seems to become more attractive for consumers, and (3) New technologies can arguably pave the way for an increased number of new ideas and concepts that needs to be transformed into new products and services.

Figure 1-3: Voice & Data Growth Prediction



Source: Informa Telecoms & Media (2011)

A prediction in the industry is that Voice traffic is on the decline (Figure 1-3), and data usage is increasing. Most Data-based services are strictly based on TCP/IP (Transmission Control Protocol/Internet Protocol) type technology that not only poses a problem in terms of driving usage and revenue but is also allowing the development of data familiarity with consumers. The building of fibre networks is also allowing low cost transmission for voice and data which ultimately produces the cost and economies of scale advantages. Informa Telecoms & Media forecast that the revenues generated by the global mobile industry will grow at a CAGR 3.3% (Compound Annual Growth Rate) between 2010 and 2015. Thus, in the current tough global economic climate, companies must take hard decisions about how to invest their limited resources to capture additional revenue.

Technology has conceivably become a driving force in the telecommunications sector. As a result the search for competitive advantage has arguably led to the recognition of innovation as a vital ingredient for survival and profitability in the 'ICT Age'; however most of the previous innovations coming from established companies were historically developed for their existing customer base which has resulted in subtle differences between the different products and services. In recent times, the associated rate and type of emerging technologies are potentially creating a complex and turbulent environment for new opportunities or threats that have the potential to shape the futures of the established incumbents and new entrants in the industry. The changing times in the ICT sector seem to be demonstrating the basic fact that

established incumbents and new entrants are sometimes standing on equal footing in their attempts to secure new market segments as new innovative ideas are noticed to be more prominent in this age, than in the past times.

1.3 The Problem in Review

The orientation above has identified a number of potential complexities that are underlying this study and therefore require further consideration. The competitive landscape and dynamics of the telecommunication industry is bringing about radical changes. The high rate of technological change seems to be **reshaping the telecommunications industry** in that it allows an increased degree of competition. The increased competition has a tendency to influence the choice and reaction of the organisations, but also increases the risk of decision errors when it comes to the planning for further growth. The nature of the industry has also indicated that the differentiation of products and services through **innovation** is an important weapon as external factors such as regulation shows a tendency to influence the pricing to benefit consumers and their expectations. However, organisations need to be very careful as to which innovative projects resources are invested into. The new emerging technologies may present new product opportunities for all industry incumbents; however the transition, usage and acceptance of these types are questionable. This aspect gives rise to another dimension of how the organisation is able to adapt and counteract the negative impacts of a) increased competition, and b) Really decide on which **technological wave** to ride. The evolution of the industry and its higher than normal technology presence also has the tendency to produce products that are not necessarily initially required by customers, and can therefore impact the organisation's **strategic planning activities** that now evolve into a management dilemma of a technology push or market pull product development process. Should the organisation cater for the needs of the market or produce products that consumers may not necessarily use, for now that is.

The new competitive environment of the 21st century, which now includes increasing varying strategic initiatives and unpredictable conditions, is placing enormous pressure on organisations for change, especially changes in technology. The mere mention of organisational change creates panic and nervousness amongst the leaders and employees of any organisation. The researcher, being part of several

organisational restructures over the last 2 years can attest to the disruption that such exercises created, one can only imagine the scale of change that is required in current times, where now the scope of change potentially touches on every aspect of the organisation. Over time organisations tend to develop some bureaucracy in their processes, systems, routines and procedures that invariably leads to an engraving into the firm's personality. On one hand, the engraving of routines are a major advantage as they provide the benefit of developing and sustaining existing capabilities that increases efficiency, but on the other, changing them could prove to be cumbersome and challenging.

One of the most prominent aspects to surface in management circles has been the internal debates as to how organisations successfully deal with change. On one side of the fence, one believes that change is about changing people and their mind-sets and then on the other, it is about changing the systems and processes that drive change in people's behaviour. Sometimes one is led to believe that the decomposition of organisational routines and procedures are much easier to accomplish in recent times because of technology. The very presence of technology is sometimes considered to be the saviour that now ensures that the introduction of new approval workflows are performed efficiently and organisations should no longer have the excuse of long decision-making trees, but in the real world, how true is this? In the current business environment, being fast, responsive, and flexible is increasingly important. What kind of organization will thrive in the fast-moving and ever-changing market place: a rigid organization whose members cling to old ways out of fear, or an innovative one that seeks and embraces change?. The current business environment is filled with ambiguity and discontinuity, and the rules of the game are also in a constant state of change which now demands near continuous adaptation from incumbents.

New product development and innovation have evolved to include highly complex steps which require closer supervision during each innovative stage. Innovative ideas can surface across all organisational products, services, processes, capabilities and competencies, but the idea cannot be implemented to improve performance if there are forces that are not susceptible to change. The flip side to this is that technological innovations occasionally arise that are so distinctive that they have the potential to render previous products and services obsolete in a given

technological sector. The introduction of the mobile handset is a classic example of competition to the fixed-line telephone. These radical innovations occur as part of the process of technological evolution, but can technological organisations really keep up with the rate of technological change?. Sometimes technological innovations evolve into a technology which has a severe impact on the incumbents existing products and services as now there is room for the development and manufacture of better and cheaper products that didn't exist before. This innovation thus creates a new market or reshapes an established market, and it comes in the form of a new product or service or a new business model. At first established market incumbents ignore or dismiss the potential implications of the new, emergent technology as being irrelevant to the needs of their existing customers until the product based on the emergent technology finds its way into the mainstream market segment and erodes the incumbents market share. Thus the new technology and based product displaces the existing one by introducing a new customer benefit or lower price of manufacture and therefore disrupts the market. Therefore the prominent existence of disruptive technology in recent times can be defined as emerging technology whose arrival in the marketplace signifies the eventual displacement of the dominant technology in that sector.

One of the most difficult challenges facing the market leader is maintaining its leading position, and more specifically, how market leaders are able to respond to disruptive innovations. This is especially true in the ICT industry where multiple product generations and rapid technological evolution continually test the ability of the incumbent to stay ahead of potential entrants (e.g. Voice over IP and other TCP/IP technology). The introduction of Skype and now Google Talk has allowed a cheaper and more efficient means of communication which implies that current providers need to be very wary of the threat that this type of technology brings to their existing revenues and profit. If one further considers this impact, then the consumer could now utilise a single device, a PC, instead of a PC and Mobile handset in the workplace. One of the possible effects of this, is that the mobile handset can no longer serve as a tool to enhance the attractiveness of the sale of a network contract or increase the loyalty of the customer which now has more impact on the organisation's bottom line. A potential implication of this for business strategy and planning is that competitive advantage is temporary and that sustainability is at

best, a short series of short-term advantages. This is arguably the most perplexing management issue to date, where when an organisation is faced with a changing environment and increased competition, instead of changing tactics, strategy and existing business practises, they drive their past successes and winning formula in order to sustain existing profits.

In these current times one believes that the organisation's innovative functions have very strong links to the market where many product decisions inherently consider the needs of the customer, because profitability is one of the key aspects to sustain shareholder value. A potential issue with this approach is that companies fail in the face of new technology precisely because they have a tendency to listen to the needs of their existing customer base and therefore innovate with this in mind. They ignore or dismiss the potential implications of new, emergent technology as being irrelevant to the needs of their existing customers. Therefore one has to consider the implication of these elements on managers as their roles need to be redefined to remain relevant in this ICT age. An implication of this is that the number of different influencing variables that need consideration cannot be underestimated and now requires close attention during decision-making and further business choices.

A change in one's thinking is also required as technological disruption is not a straight forward aspect, whereby variables are plugged into an equation, and out pops out a solution to the dilemma. Additional planning processes will need modification and innovative challenges need to form part of strategic objectives. The net effect is that while one's domain was rather small and decisions were made under a very small umbrella with a very limited amount of factors to consider, the nature of the game has changed and is continuously being altered. The boundaries have now been extended to allow an overcrowding of new players and decisions that could have been made with ease because they worked in the past are now nullified because of a varying context. One has to surrender to the reason that the old conditions and ways of thinking and acting are destroyed when creativity introduces new ideas and concepts, making the innovative act a double-edged sword. On one hand the innovation adds to the value of the organisation by introducing a new service, product or process that increases the efficiency and effectiveness of the

innovation finding firm, on the other it serves to destroy and change the old mental modes and models of the established ones.

Many new start-up firms aim to dislodge established incumbents with their new niche ideas and concepts. Personally, this changing viewpoint raises a concern, as while the established organisations were concerned about each other, a shift in focus is required to combat the strategies of small-start-ups that potentially have flexible operating and decision-making structures which are backed up by agile procedures, routines and processes. The intensity of competition is also potentially becoming a huge industry variable where competitor commercial intelligence and the propagation of this information along the organisation could be the weapon that causes the most destruction. One has to therefore be concerned about a number of new threats, while still ensuring that all the other aspects of planning, organising, leading and controlling are still performed effectively.

It can be argued that technology is a way of life and it is indeed the organisation that allows the innovation to transition into a disruptive event because of the organisational rigidness that has accumulated over its existence. Mature organisations, with a history of success and limited competition possibly become less able to adapt to new technologies, preferring to seek out innovations that complement its capability, and avoid competence destroying technologies. If one considers this particular element more closely, this denotes that management is at times accustomed to matching its strengths with the disruption and ultimately performs all technological decision making in accordance to this. This mentality has some severe effects, as one may not be able to think outside the box, but have the safety net and belief that the concluded decision contains the least risk.

Strategy in its context may remind one of the military, a broad set of principles and objectives determining the conduct of war. The important aspect to remember is that strategy is not the tactical decisions that are performed day-to-day. It's about understanding the strengths, weaknesses and threats of an opponent and combating these with opportunities that present themselves or newly created ones through the environment. The concept of competitive strategy to the researcher is about being different, it means choosing a different set of activities and tasks to deliver a unique

mix of value to the market. With new technology being available industry occupants are ensuring that these aspects are incorporated into their future planning and strategic initiatives. This arguably highlights that the strategic planning processes are evolving in their complexity as the organisation is caught between the matching of existing customer needs, or providing additional product benefit and functionality that is not currently being used by the consumer. If one considers the strategic planning process, then risk and scenario planning comes to mind that adds to the existing mix of variables to consider. What does this mean for strategy and technology? The alignment of strategy with organisational purpose can arguably be viewed as a crucial element that every CEO's wishes to propagate, however it is not easily accomplished in the researcher's view. So if one adds the rate of change of technology to this, and a fact that technological driven organisations thrive on technology to perhaps drive strategy, then strategic-organisational alignment now has the tendency to be even more difficult to achieve due to the increased dynamics.

The disruptive nature of technology in the SA telecommunications industry cannot be underestimated as these innovative types have the tendency to leave existing incumbents stagnant in their markets, while allowing the potential progression of new innovative start up-firms. There is arguably no space for the same old proven technologies and an equal share of profits.

1.4. Problem Statement

As businesses have become good at managing quality, quality has arguably become a sort of commodity, necessary but not sufficient to ensure success. When every company offers quality, quality no longer differentiates; therefore businesses must look elsewhere for differentiation. The next arena for competition has perhaps become innovation in which technology has become a primary enabler.

In high technological industries this implies that the evolution of technology creates new disruptive innovative opportunities; however organisations need to strategically visualise the substitution of its existing technologies that have arguably brought the current successes. Therefore, the problem statement can be formulated against the substitution of technology to achieve future competitiveness, and stated as,

There is an over-reliance on Proven Technology in the SA Mobile Telecommunications sector.

1.5 Research Questions

The problem review has allowed a number of potential questions to surface, which are relevant to the research problem. These are,

- Do all industry leaders understand the concept of disruption and the re-shaping of the industry that originates because of it?
- What are the elements that cause incumbents to continuously use legacy and old technology?
- What organisational changes are imperative to take advantage of Disruptive Innovation?
- What are the implications of Disruptive Innovation on the Strategic planning processes of an organisation?
- What are the implications of Disruptive and Emerging technologies on the market and customers?
- How can the management of disruptive innovation provide the real benefits to industry occupants?
- Where are the largest impacts on the organisation's business models due to disruptive technologies?

- Why do incumbents still have a strong dependency on proven technology?
- Does the adoption of disruptive technology always lead to the market dominance and increased competiveness?
- How does an organisation allow new technology to become disruptive in the market place?
- How is the risk profile of an organisation related to the disruptive nature of technology?
- Are the competitive nature and market structure the only elements that allow emerging technology to become disruptive?

1.6 Research Objectives

Given the comprehensive list of questions and the limitations in this study of time and other practical issues, specific research questions have been selected and proposed here as research objectives.

1. **To gauge the level of awareness amongst industry occupants with regards to the disruptive nature of emerging technology in the SA Telecommunications industry.**
2. **To identify the primary determinants that causes incumbents to retain existing technologies.**
3. **To ascertain whether the early adoption of disruptive technologies will always lead to increased competiveness.**

1.7 Limitations and Delimitations

This study will only include disruptive innovation in terms of technology that is present in the SA Telecommunication industry. This may be a severe limitation as a vast amount of literature does indicate strong links internationally and across multiple industries with respect to this problem area.

In terms of studying the factors that cause over-reliance, there are a number of challenges with such an approach. The factor may be tied to specific good or bad market idea. Human memory is selective, ideas that were eventually converted are more likely to be viewed, in hindsight, as having been the most promising to start with. The selective nature of memory will introduce a systematic bias into data obtained in this manner. Second, ideas that do not get past a certain minimum stage in the development process are likely to go unrecorded and be eventually forgotten. This implies that a particular incumbent's perspective on disruptive innovation could be a little skewed and based on a good or bad idea.

Certain guidelines already exist to deal with disruptive innovations in general, but it is not in the scope of this project to give any specific advice to incumbents on how to deal with disruptive technologies on a case-by-case basis.

Since disruptive technology that is used to provide mobile services is still new and very dynamic, little has yet appeared on the subject in academic articles that are published in journals; therefore a literature search may not provide enough related information about the topic.

1.8 Importance of the Research Study

The ability to convert inputs into outputs is a critical determinant of success in many industries. It is the potential element that set organisations apart from each other in the same industry. Therefore disruptive innovation is deemed to be an important economic activity and phenomenon that ought to be investigated because insights into its nature are useful. It is possibly the key to the reasons for the differences in the rates of technical progress amongst organisations. Disruptive innovation constitutes an important opportunity for growth in all firms. However, if ignored, it can turn to a severe threat. This implicates that there is a need for identifying and evaluating potentially disruptive innovations and passing this into the strategic planning processes of the organisation. Technology over-reliance, especially in this ICT age can leave an organisation dependent on past successes that create stagnation, which limits growth and results ultimately in industry failure.

Since the introduction of the term disruptive technology and the convergence of IT protocols (TCP/IP) with the GSM telecommunications Type (Common Channelling system Number 7), there has been renewed and increased interest in the field of innovation in respect of offering IP type services in the telecommunication space. The convergence of charging and Value-added types has also paved the way for innovative ways of thinking and designing new features.

The real strategic challenge for managers is to visualize an active market where today it is regarded as being saturated. New business models which can potentially generate multiple sources of revenue through business partnerships with service providers and content providers needs to be developed or optimised. Technology investments also need to be justified and implemented within shorter timescales, application development cycles should generate more innovative and flexible solutions; and operational resources and infrastructure have to be adapted in order to achieve the necessary cost efficiencies, therefore disruptive technology is seen as one of the enablers to shift to the next wave of mobile communication. It is imperative that incumbents need to be prepared to take opportunities that surface in order to create future shareholder value and a satisfied market.

1.9 Outline of the Report

Chapter 1: Introduction and Background

This Chapter introduces the purpose of the research, the problem statement, research questions and the objective of the research. It also states the importance of the study and why it was undertaken; lastly, it highlights the limitations and shortcomings of the study.

Chapter 2: Problem Analysis

This Chapter provides the conceptual theoretical models and methods used within the research. The objective of this chapter is to produce a business case for the research area of study.

Chapter 3: Literature Review

This Chapter reviews the theoretical literature to determine the wider perspective of the topic and problem complexity that are external and gathered through the experience and knowledge of experts in the field. The focus of this chapter is the creation of the academic case with regards to the research study.

Chapter 4: Research Design and Methodology

In this Chapter, the information and understanding gained in the literature review and problem analysis are used to design the research approach and instrument that will be used in the survey. The survey instrument to be used in this study is a formal structured online questionnaire.

Chapter 5: Research Results and Discussion

The research results and study findings will be interpreted and discussed to determine whether the problem statement is disproved.

Chapter 6: Conclusion and Recommendations

In this Chapter, the conclusions are drawn from the data analysis and findings of the research. A number of recommendations are proposed to manage the problem area of study within an organisation in the Mobile Telecommunications Industry.

1.10 Summary

In South Africa, the telecommunication industry is showing the potential for significant change in terms of competition and regulation, therefore incumbents will feel increased pressure to sustain leadership in a saturated market. The problem in context and review has highlighted that the problem area is very relevant in these current times as competiveness and profitability will be challenging variables in the industry. The pricing of services is also becoming prominent factors to consider as regulation and the cost of technology is driving down the end price to the consumer, however, there are limited patents that organisations really own. Therefore innovation is arguably viewed as the vehicle to drive down the cost of manufacture so that pricing and quality is a continuous delivery from the various network providers. The new entrants will attempt to dislodge established providers with new ideas and designs that optimize, improve or provide new product functionality. There is also a significant increase in the rate of technological change that will form a potential base for disruptive innovation to surface.

Chapter 2 - Problem Analysis/Theoretical Considerations

2.1 Introduction

The problem review has opened up and highlighted a few critical aspects that need further analysis if the unraveling of the underlying complexity of this research problem is to be achieved. The approach here will involve the exploitation of the underlying theoretical considerations to uncover the nature of the issues. This Chapter aims to further establish the business case of the study in which it addresses the business benefit that this activity seeks to meet. This benefit usually appears in the form of financial growth, profitability, increased stakeholder value or brand dominance.

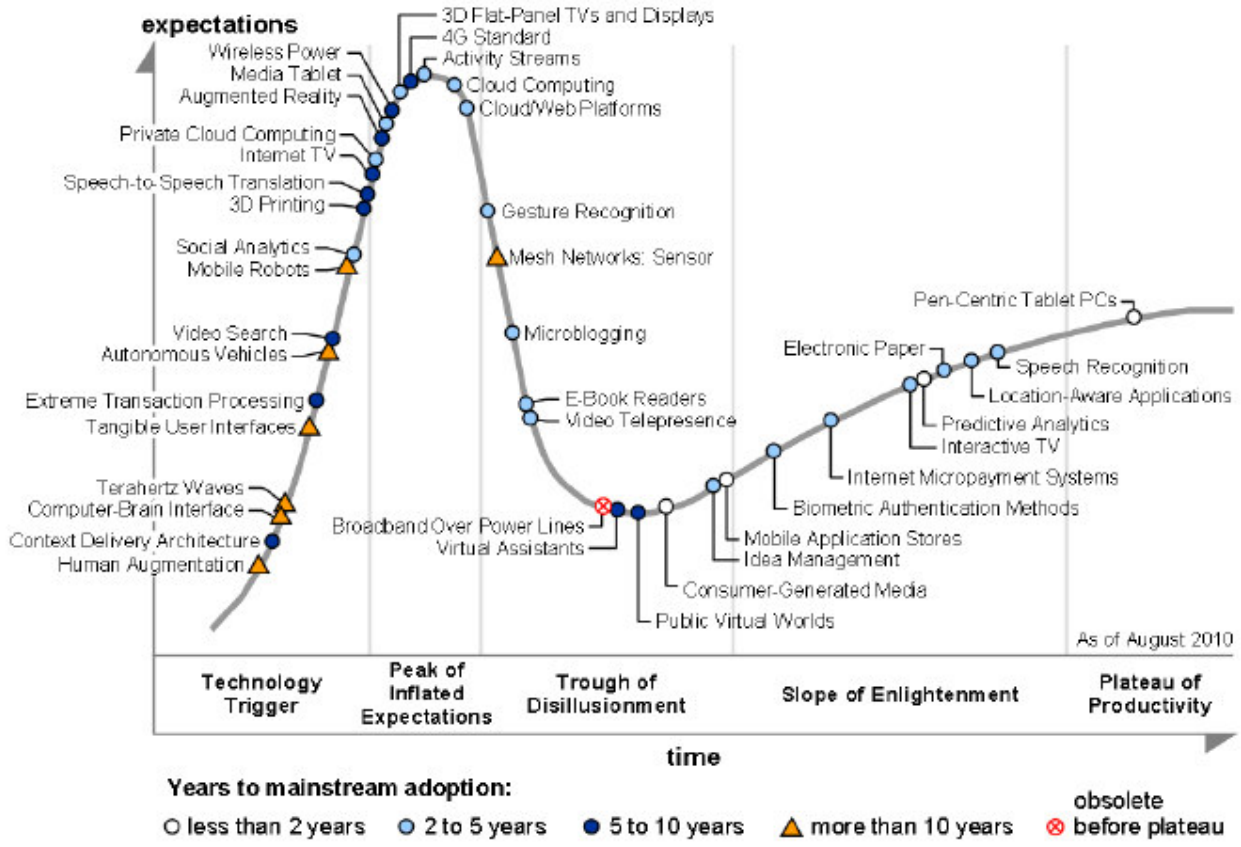
2.2 Theoretical Considerations

Emerging technologies (aka disruptive technologies) present both challenges and opportunities to organizations engaged in product or system development. The challenges include identifying, understanding, and selecting technologies that will benefit the organization's activities. A definition expresses emerging technology as "new technologies currently developing or [*that*] will be developed over the next five to ten years, and which will substantially alter the business and social environment" (BusinessDictionary.com, 2010).The rapid pace of technology change, emergence of technology opportunities, and disruption of existing project or program activities by new technology requires a management approach to incorporate or leverage changes in order to flexibly respond to presented opportunities.

The Hype Cycle for Emerging Technologies that is depicted in figure 2-1 is useful in strategic planning, innovation and emerging-technology predictions by highlighting a set of technologies that will have broad-ranging impact across the business. The hype cycle indicates that there is strong technology presence across many other technological industries that have the tendency to reshape each other. Electronic tablets and other devices that support mobility into the various network providers do exhibit a tendency to provide the consumer with the "always connected" ability. The tablets do exhibit a tendency to replace the mobile handset which will have an impact on the various network providers and the way that the handset is portrayed in the market. The aspects of the mobile office come to mind with this sort of

technology, where employees are able to work at any site and at any time. The external factors such as the increase in toll road fees and the general cost of transportation can perhaps promote the concept of “Office@Home” initiatives.

Figure 2-1: Gartner Hype Cycle



Source: Gartner (August 2010)

Source: Gartner (2010)

A number of technologies have moved along the Hype Cycle significantly since 2009:

- 3D flat-panel TVs and displays have moved rapidly since 2009 (when they appeared as "3D flat-panel displays"), from shortly after the Technology Trigger to a position near the peak, due to intense vendor activity and product announcements.

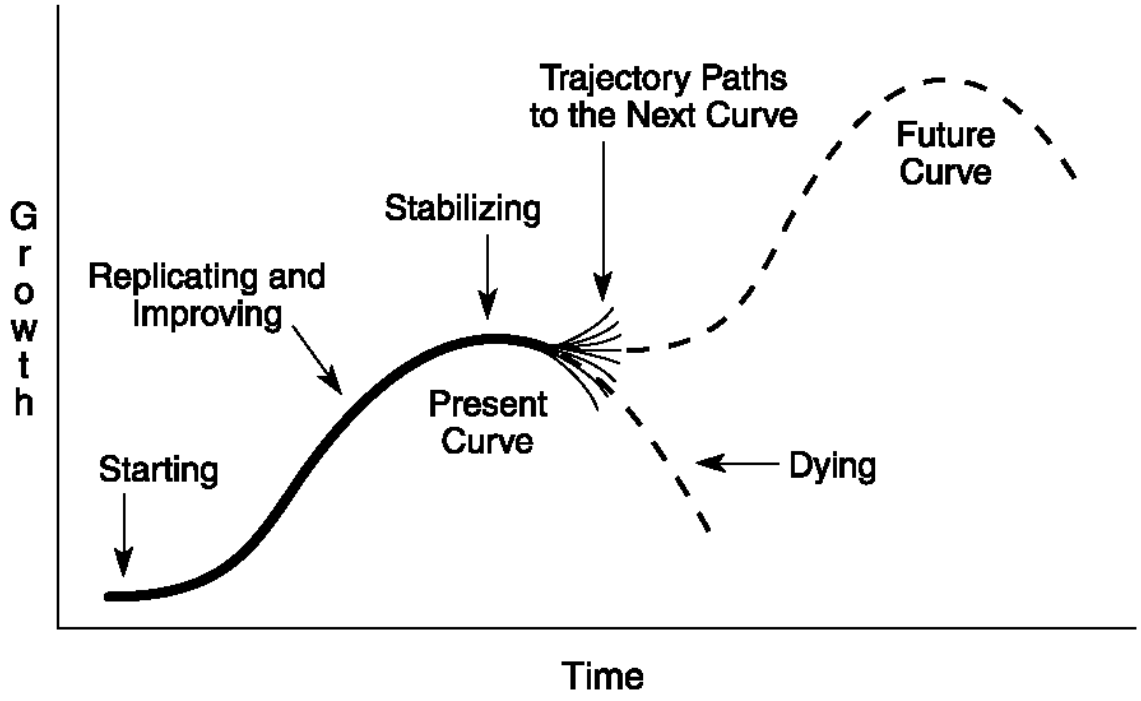
- E-book readers have dropped from their peak last year, as media tablets, particularly the iPad, threaten the value of a stand-alone reader.

- Micro-blogging falls toward the trough as enterprises struggle to find the value, even as consumer popularity continues.
- Video Tele-presence is falling toward the trough due to still-high pricing, which limits adoption. However, those who have adopted are inevitably impressed with the sense of "being there" that the technology delivers.
- Pen-centric tablet PCs (last year, these were called "tablet PCs") approach the plateau, while potential competition gathers from touch-based media tablets.

The 4G (4^{th} Generation) is on the “peak of inflated Expectations”. In this phase, a frenzy of publicity typically generates unrealistic expectations. There may be some successful applications of this technology but this is due to experimentation and testing. A number of high failures of ideas would also be apparent during this phase but it allows great experimentation and learning at this stage.

In the innovation management field the S-Curve illustrates the introduction, growth and maturation of innovations as well as the technological cycles that most sectors experience. In the early stages large amounts of money, effort and other resources are expended on the new technology but small performance improvements are noted. Then, as the knowledge about the technology accumulates, progress becomes more rapid. As soon as major technical obstacles are overcome and the innovation reaches a certain adoption level an exponential growth will take place. During this phase relatively small increments of effort and resources will result in large performance gains. Finally, as the technology starts to approach its physical limit, further pushing the performance becomes increasingly difficult, as the figure 2-2 shows.

Figure 2-2: Innovation S-Curve



Source: Gartner (2010)

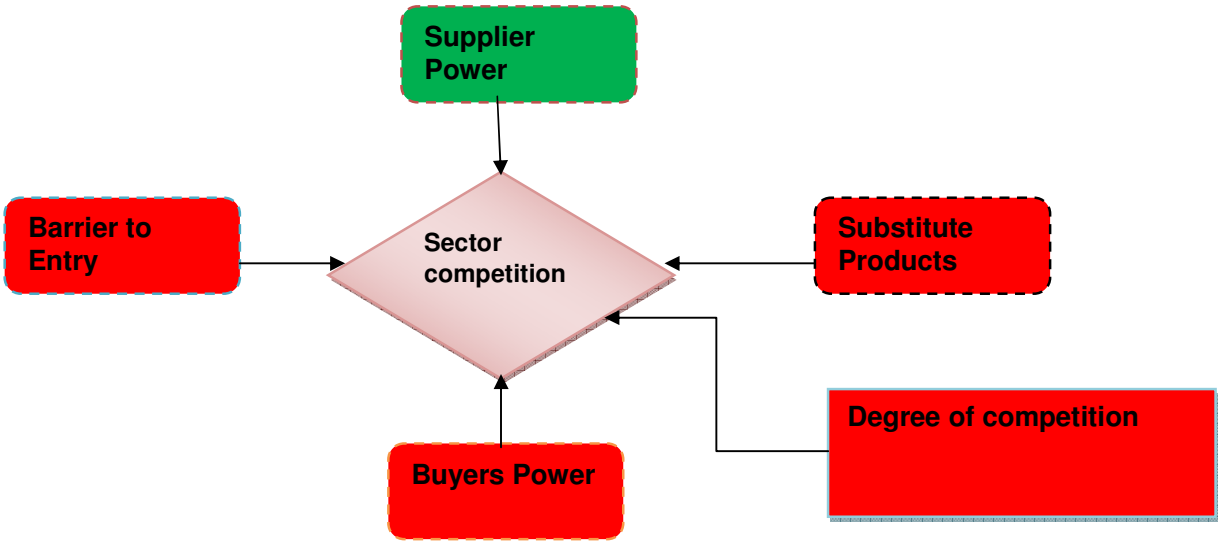
Consider the telecommunications data industry, where the initial architecture involved Low bandwidth GPRS transmission. Once the technology reached a certain level of development the know-how and expertise behind the development started to spread, boosting the speed to a factor of 2 and thereafter lead to the introduction of 3G .This innovation created a new S-curve, shifted to the right of the original one, with a higher performance and bandwidth limit (based instead on the capacity to multi Thread and advances in technology). The 4G S-curve will cause the existing 3G one to shift, however the 4G technology has the ability to combine both telecommunications and other wireless technologies such as "Wireless Power" (Hype-Cycle) which now highlights the uncertainties in predicting the limits of a future 4G S-curve. The uncertain nature of 4G and its impact on the telecommunication industry has the potency to also influence the various strategies and industry shape.

While the Electronic Communications Act has fundamentally changed the market structure of the telecoms sector, legally opening up the market to competition, this has yet to materialise in practice. However the rate of change of technology is arguably a more prominent driver of competition that has also allowed an overcrowding of communication players. The South African telecoms market

continues to reflect a market with a number of vertically integrated operators. This includes two very strong incumbent mobile operators ,a potentially weak third entrant and a fourth new player.

Porter (2008) indicates that industry structure drives competition and that technology and innovation are factors that impact the primary five forces shaping competitive strategies and ultimately industry structures.

Figure 2-3: Porter's 5 Forces



Source: Porter (1985)

The concentration of operators competing in the South African telecommunications industry is relatively high (i.e. at present, 2 fixed line operator and four mobile operators), and subsequently competition is intense especially in the cellular mobile market. The South African market is also showing signs of saturation, with penetration rates attributed to consumers owning more than one SIM-card in order to access the different bearer services. The providers are also targeting the same market segments and at the moment choose to ignore under-serviced and rural areas.

In past times barriers to entry in the telecommunications industry were relatively high, due to the considerable investments required to build up an extensive network

and bandwidth capacity. The contestability in the telecommunications market largely depends on the ability to earn a return on capital invested. However, capital requirements could reduce as wireless technologies become more efficient (e.g. forthcoming Skype Internet phones). The onset of new technologies such as WiFi, Bluetooth, WiMax and VOIP can affect production costs dramatically. The introduction of MVNO (Mobile Virtual Network Operators) now creates the ability to use an existing providers network as a virtual operator to offer communications services which makes entry into the industry much easier.

Business scale is important for service providers as customers increasingly demand cheaper bundles of services across an array of products. New entrants in the cellular and wireless market would be exposed to price wars from the established firms, and, are faced with choice of entering on a small scale and being exposed to high unit costs or entering on a large scale and running the risk of underutilized capacity while they build up sales volumes. Established firms also have established their core competencies and possess the complex technical expertise required to operate in the telecommunications industry, new entrants could acquire the skills but would still need to inevitably be exposed to learning curve effects thereby delaying their penetration into the market. Customers are increasingly demanding flexible and cheaper service bundles with a comprehensive network service provider. The introduction of cheaper services may decrease the behaviour towards established brands.

Product and service offerings in the cellular mobile market are relatively close, therefore switching costs for buyers are similarly relatively low. The introduction of MNP (Mobile Number Portability) has also increased the ease at which customers can migrates across networks, but still retain their mobile contact numbers. The introduction of a second fixed line operator provided buyers with an alternate service provider in terms of fixed line and Internet services, switching costs may therefore decline especially in the Internet domain. However, new entrants will still have to recover its cost of capital which will largely influence its pricing strategy, a new entrant has also based their pricing strategy on the mobile termination rates (MTR), where they have applied to ICASA for a reduced rate. Fixed costs relative to variable costs for established incumbents such as Telkom, Vodacom and MTN, are high due

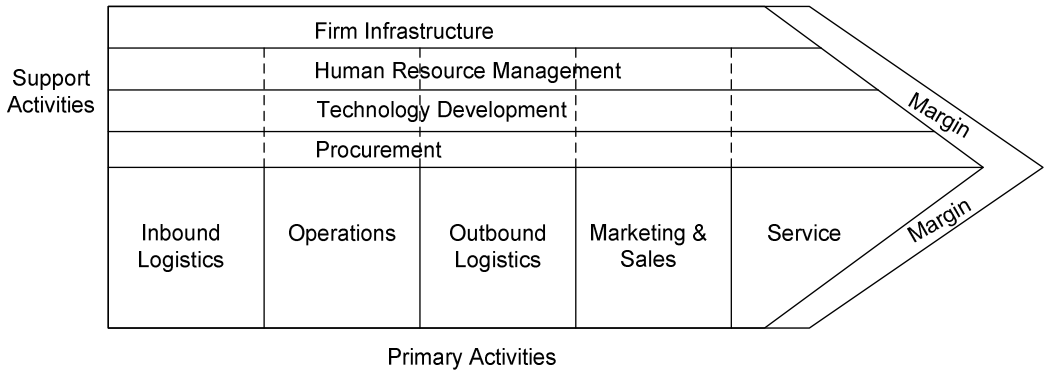
to capital outlays in infrastructure. Scale economies therefore, encourages them to compete aggressively on price in order to gain the cost benefits of greater volume. Other operators such as Cell C and Virgin Mobile do not have this benefit.

Cellular mobile technology is a disruptive innovation in its own right as it has proven itself as an effective alternative to fixed line telephony. Switching costs have increasingly decreased as mobile cellular operators compete for the South African market on the basis of bundled packages. Buyer propensity to switch to alternative service providers in the mobile cellular market may be limited by fixed term contracts that lock customers in for the duration of the contract, however this is about to change with a modification in regulation where the mobile handset will no longer secure a contract of 2 years. The relative price performance of substitutes such as broadband wireless technologies have further introduced alternatives ranging from voice to data services (e.g. VoIP/Skype versus Fixed/Mobile telephony). New Technology arguably shows the most potential to disrupt within this force.

All mobile operators have the potential to enter the fixed line market; however the operator that can provide fixed and mobile convergence at a competitive price can prove to be very competitive. Nearly everybody already pays for phone services, so all competitors now must lure customers with lower prices and more exciting services. This tends to drive industry profitability down. In addition to low profits, the industry will suffer from high exit barriers, mainly due to its specialized communications equipment. Networks and billing systems cannot really be used for anything much else, and their swift obsolescence makes exit even more difficult. On one hand technology is driving fierce competition, while on the other it is dictating the margins of all occupants in the industry. The telecommunications industry was once a niche market in the past where the cost of services were expensive, however the sector is now evolving where pricing is seemingly becoming an important factor, especially when network providers are taking aim at rural and under-serviced areas. An implication of this is that the providers will now need to check their respective business models in order to produce services at a lower cost to sustain profitability from the market, which brings up the element of efficiency and the methods and tactics to increase this aspect.

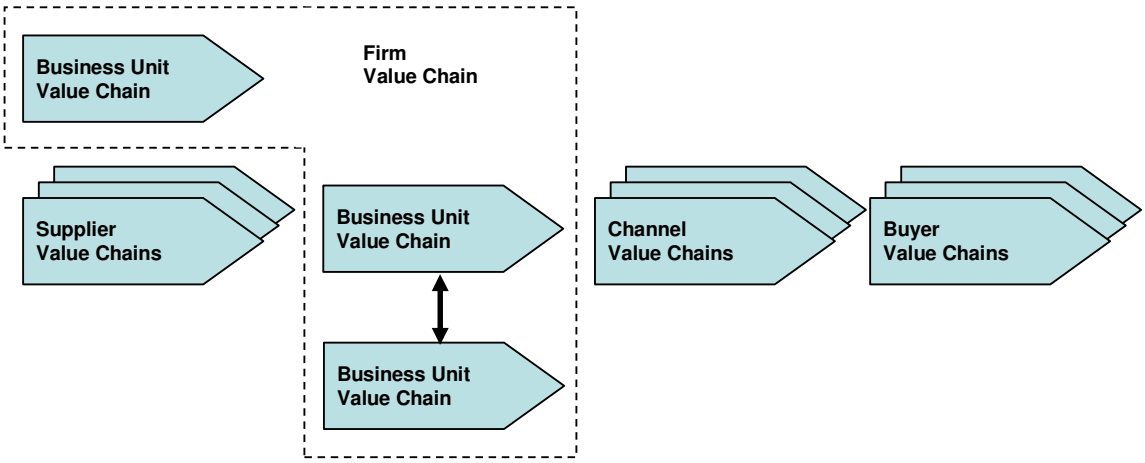
The value chain is a tool that disaggregates the strategic activities that a company performs in order to understand the behaviour of costs and the sources of differentiation that provides the competitive advantage. Figure 2-4 provides Porter's (1985) generic two dimensional value chain diagram indicating the primary and support value creation activities all companies perform. Primary activities are defined as activities that bring about direct value to the customer, whereas support activities enable and improve the performance of the primary activities.

Figure 2-4: Porter's Value Chain



Source: Porter (1985)

Figure 2-5: Porter's value system for a diversified firm



Source: Porter (1985)

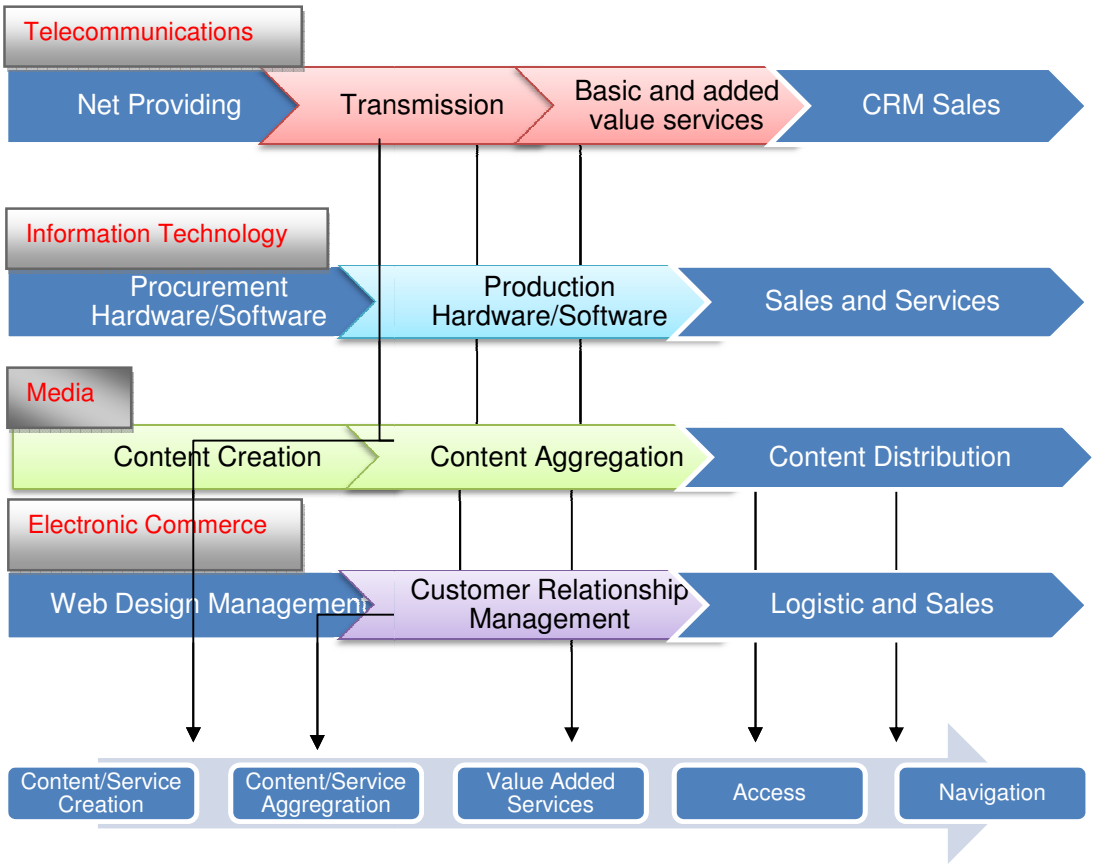
The margin at the end of the value chain indicates that all activities are linked and can be seen as cost elements subsequently contributing to the collective cost of

performing the value activities and determines the value delivered at the end of the chain.

The various providers in the mobile industry have developed strong links with various international suppliers of telecommunications equipment, the different architectures and software is provided and to a large extent managed by suppliers such as Nokia-Siemens-Networks, Ericsson or Alcatel-Lucent. While it was feasible in the past to operate with a joint partnership with these suppliers due to the high growth in revenue and market, it is becoming progressively difficult to continue without the consideration of costs, especially as the supplier was accustomed to charging the network providers premium rates for products and services. The operators strategic roadmap was linked to the technology that the supplier was able to deliver. This has to change if network providers are to produce services that are attractive in terms of pricing. It must be noted however that forgoing to long established supplier-provider relationship has many advantages, however there are numerous disadvantages as well.

While the various network providers are under severe pressure, to modify their existing value chains, the convergence of the telecommunications, information technology, media and electronic commerce seems to be adding to the challenge of the redesign that ensures competiveness in the industry. Figure 2-6 provides a simplistic value systems view of the horizontal and vertical integration of the telecommunication, information technology, media and electronic commerce industry value chains in order to form a new converged ICT and media industry value chain

Figure 2-6: The Converged ICT Chain



Source: Witz (2001)

The original value chains comprise of various industry-specific functions which during the reconfiguration process are rearranged with new roles assigned to form a new single value chain for the converged industry.

The convergence of technologies has fundamentally revised the ICT value chain, with several megatrends emerging, namely; Technology Convergence itself, Workforce Mobility, Security, Broadband, Managed Network Services, Hosting, Media-Infotainment and Advertising. With the evolution of Fixed/Mobile communications technology and the dependency on integrated IT solutions, customers today are demanding a unique approach to service delivery and cost reduction within their Information and Communications Technology environment.

Most recently, the emergence of uniform Internet Protocol (IP) standards has promoted the demand for IT and telecoms services. While digitisation allowed for the convergence of broadcasting and telecommunications services through reduction of data into bits that could be carried across any platform, it is through new IP-based networks that seamless communication across integrated networks can be realised. Such networks are generally referred to as Next Generation Networks (NGNs) and allow for lower-cost IP-based services, such as Voice over IP (VoIP) and IP Television (IPTV), to be transmitted over single platforms. These developments require that any value-chain analysis of operators, services or ICT companies be dynamic, flexible and open-ended. A major implication arising from these trends is the huge increase in available capacity, historically a scarce resource. This effectively means that the marginal cost of the network capacity that is required to provide carrier services is insignificant and may even be approaching zero. Network infrastructure is increasingly being characterised as a fixed cost. The implication of these trends for the SA telecoms industry is that networked business models will increasingly be based on services supplied. In conjunction with the changing dynamics of the telecoms industry, the role of regulation has extended from concentrating on consumer disputes, universal service issues and price-setting to a much broader role of regulating the sector to enable competition.

According to KPMG, delivering Mobile Internet services will be a radical departure from anything traditional operators have done before, but not all will make the transition successfully. The scope of change required is considerable, as both existing revenue and cost models become redundant. Success will mean getting to market quickly, armed with the right applications and the right services. However, telecommunications operators will need to do this with partners. They must develop new ways to address their relationships with customers, vendors, applications developers, content providers and service providers. This includes entering risk sharing arrangements with equipment vendors and application developers, and opportunity sharing arrangements with information and content providers.

The distribution of value in the value chain will shows signs of a rapid shift. Presently, approximately 70% of the value has remained with the operator; in future, 75% of the value could belong to content providers, content creators and service

providers. Few, if any, operators are likely to make this transition from providing voice services to providing the new mobile data services without a partner which will share risk, maximise opportunity, and minimise time to revenue. The organisation is faced with a double issue, in that it has to re-arrange its own value-chain while dealing with the convergence of the other respective types. New infrastructure based on data communications principles will drive business models more closely towards the data and computing industry, and away from the telecommunications industry models of incumbent market dominators or oligopolies. Future business models show a tendency for much lower costs, with simpler operational processes. Moreover, one can expect to see content provision appearing in the traditional value chain.

For network providers to succeed in the new converged ICT arena, one implication is that they will need not only to adopt new business models but will also need to generate multiple sources of revenue through commercial transactions with third party content providers. Even more importantly, they will need to forge new relationships with customers and vendors alike. Another implication is that there could be numerous iterations that will be required in their strategic planning activities in order to compete effectively.

Grant (2005) defined strategy as a unifying theme that gives coherence and direction to the actions and decisions of an individual or organisation. The process starts with developing a strategic vision, setting objectives and developing plans to achieve these objectives. This is then followed by the implementation and execution together with the continuous monitoring and evaluation of the organisations progress. A company's strategy thus indicates the choices its managers make about how to attract and please customers. It entails the development of a strategic vision and then followed by implementation and execution to achieve the objectives.

In order for the industry players to achieve low consumer prices, the organisation has to move to low production costs. In maintaining cost leadership the organisation should not forget about achieving functionality and quality within its products. The role of technology in generating competition and the convergence of the

telecommunication, Media, E-commerce and IT value chains have emphasised the importance of controlling costs in the industry to achieve growth and profitability.

In recent times the researcher has noted that all too often the focus of the strategic process is on producing an action plan. In the business environment where change is the norm, this can be a misguided goal. The truth is that by the time a written document is created and distributed for review, the set of environmental factors that it was designed to address, will have already begun changing. In this ever shifting telecom environment the true strength of strategy is arguably found in the design process, therefore the greatest value is in the planning and not the plan.

The sequential approach to strategy formulation involves the following stages,

A situational analysis that involves an assessment of the internal and external environment that attempts to identify all Strengths, Weaknesses, Opportunities and Threats of the organisation. The assessment also entails the identification of internal resources and capabilities that can also be used to leverage and sustain competitive advantage. In parallel to this the overall corporate tactical objectives are devised that is cascaded and aligned to the business and functional units.

The next sequential step in the strategic process involves the implementation of the strategic plan; these activities are set into motion by,

(1) The allocation of resource that include human and financial types. Any additional support systems such as technology and other supporting organisational departments such as HRM are mobilised.

(2) A structured approach of co-ordination and integration of work patterns is devised. This also leads to establishing a chain of command and new applicable reporting structures. Essentially this involves some sort of restructuring.

(3) The assignment of new responsibilities is performed under the consideration of the aspects of culture, social interaction and processes, control and reward systems. The linkage and alignment of performance objectives are also performed.

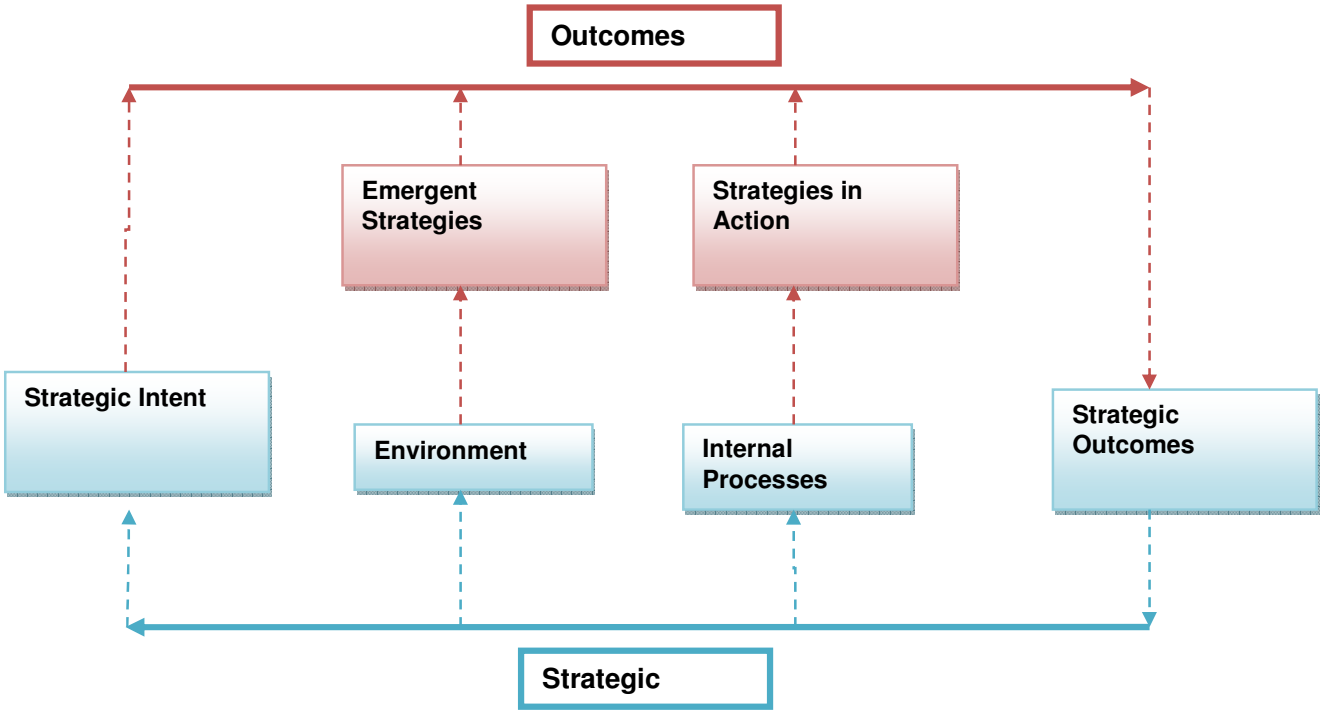
(4) The management process also remains a key element. Managing change and the resistances that arise externally and internally need to be considered during strategy implementation.

(5) The final step to consider is the evaluation & monitoring of the activities and feedback on whether the strategic activities and objectives are indeed being attained.

This linear model of the strategic process indicates that the elements of formulation and implementation are not related in any way and are seen as separate activities that are considered during the planning and execution process. In the face of a high level of uncertainty and change within competitive environments, strategy formulation and implementation should represent a continuous and simultaneous process. This represents a concurrent approach of identifying opportunities in competitive environments and evaluating them in the light of the organization′s existing and potential future competencies together with the level of resource commitment necessary to exploit such opportunities.

Moncrieff (1999) indicated that strategy is partially deliberate and partially unplanned. The planned element comes from two sources: “emergent strategies” result from the emergence of opportunities and threats in the environment and “Strategies in action” are ad hoc actions by staff throughout the organisation. The dynamics of the telecoms environment will set focus on the ad-hoc actions , which places additional pressure on management in general. There will now be a requirement to dedicate resources and time to thinking strategically instead of operationally. This implies that every future decision has to therefore be made with some strategic intent, but from one's self reflective, the decisions are usually made to take care of the most immediate need.

Figure 2-7:Combined Formulation/Implementation



Source: Adapted from Moncrieff (1999)

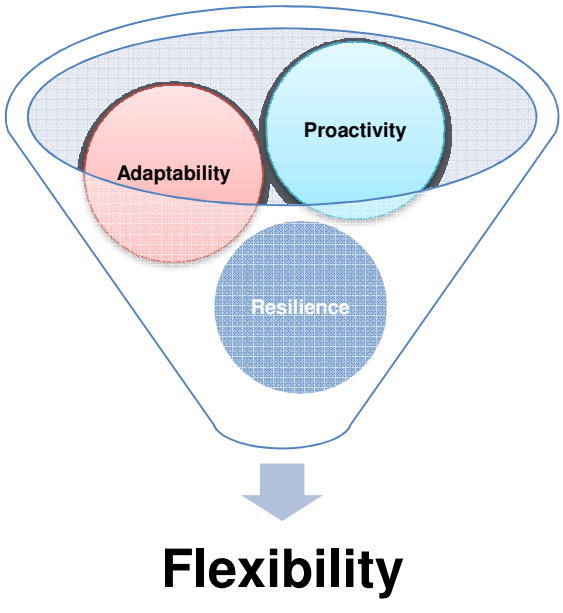
The model proposed by Moncrieff (1999) shows that strategy is planned and emergent, dynamic, and interactive. There is an interaction of five general processes. These are (1) strategic intention, (2) the organization's response to emergent environmental issues, (3) the dynamics of the actions of individuals within the organization, (4) the alignment of action with strategic intent, and (5) strategic learning. The continuous monitoring of these strategic outcomes produces input into strategic learning. This learning comprises feedback into internal processes, the environment, and strategic intentions. Thus the complete system amounts to a mix of feedback loops. The system is self-adjusting only to the extent that the organization is prepared to learn from the strategic outcomes it creates, i.e. continuously learning and strategic thinking are imperative processes. In this model, the distinction between strategy formation and strategy implementation is not existent.

In a high technological driven industry where the rate of emerging technology has the potential to quickly invalidate an organisation’s strategic plan, the sequential approach to strategy can be conceived as insufficient. A simultaneous and continuous approach to strategy produces a number of potential benefits. The main

benefit is attributed to the fact that there is a definite time-lag between when an opportunity is identified until it is taken advantage of by the organisation, i.e. time elapses from formulation up until implementation. This aspect is very critical in highly dynamic environments like the telecoms industry. Risk reduction is also another factor that arises due to the simultaneous approach, the sequential approach requires committing resources at a very early stage in terms of capital, people and time, whereas the simultaneous approach continually evaluates and dynamically adjusts resource requirements. The simultaneous process also continually adjusts strategies according to the changes in the competitive environment, but can established organisation really adjust their strategic planning procedure to take advantage of this benefit. The high rate of strategic adjustment demands that the industry occupants are able to respond to, and manage change more effectively. This combined strategic model is an effective means of managing the organisations tactics, however the *strategic intent* variable and ever other types seems to be reliant on each other. This produces a single point of failure if feedback is not received or not received in time. For instance the *emergent strategies* can possibly take a long time in a large organisation to be filtered through the structures and teams.

The management of the cultural context to achieve change remains one of the key aspects to successfully implement strategy and also sustain the change in the long term, however flexibility has become a very popular business theme by the late 90's because it was perceived as an effective response to shorter product life cycles and an increased fragmentation of market demand in the technology industry. An organisation which is flexible is able to rapidly respond to environmental change by adjusting operations and strategy quickly and smoothly to meet changes in the market. A potential benefit of this is the introduction of new technologies and the shifting of business priorities occur efficiently in terms of time and resources are backed up by quick decision-making. Over time the organisation is able to adapt to its environment more effectively by understanding all the metrics and opportunities to increase market value.

Figure 2-8: The 3 Elements of Flexibility



Source: Jones(2005)

In the figure 2-8 proactivity refers to the organisation's ability to scan, plan and anticipate future industry events and trends (Jones, 2005). This may entail the generation and evaluation of strategic scenarios and planning appropriate tactics to take advantage of opportunities. Resilience can be defined as the organisation's capability to recover from environmental or industry disturbances. An example could be an introduction of a new similar product by the competition, which is classified as an external crisis and tends to erode some share of the market. The organisation's adaptability refers to the organisation's ability to modify itself or the way it behaves when confronted with change. This may entail the modification of existing procedures and routines that assist with change or the allocation of resources to limit and deal with the adverse effects that surface. Therefore, in the context of this study flexibility contains 3 other elements of proactivity, adaptability and resilience.

After organisational efficiency and quality in the past years, organisational flexibility is conceivably regarded as the third wave of maintaining increased organisational performance. Weiss (2001) indicated that the uncertainty in the technological environment places pressure on the organisation's capacity to develop and deploy flexible characteristics in response to unexpected events. Flexibility is perceived to be a managerial task. Can managers respond at the right time in the right way? It is

imperative for the organisation to possess the managerial capabilities that promote the firm with flexibility, e.g., manufacturing flexibility to manage the supply and demand of the number of products the firm can profitably offer in the market or innovation flexibility to reduce the response time for bringing new products to market. Secondly, flexibility is said to be an organizational task. Can the organization react at the right time in the directed way? This involves the creation of a climate that promotes flexibility. As an example innovative flexibility requires a structure that caters for multi-functional teams and excellent communication processes that produce fewer barriers. This aspect also has a tendency to influence the innovative climate in an organisation.

There exists a management challenge of flexibility which is concerned with the creation of enough options that assist in promoting flexibility so that the organisation is capable of dealing with issues in a timely and effective manner. This includes both internal and external procedures. Internal procedures relate to elements that can be controlled. The external procedures are defined as elements that can be influenced. Unless internal processes can be easily adapted they can become obstructive and lead to entrenchment. The internal communications processes with regards to procurement and the selection of innovative ideas are also necessary. The coordination of work and flow of commercial intelligence (Competitor information) needs to follow a clear path so that action can be taken quickly. There is also a need to break down the silo based nature of large organisations as the same system can restrict the flow of knowledge across the organisation.

The communication flow of information is usually vertical within many organisations, and not horizontally across the organisation. An example the document review process is one such element that contains the idea generated and the expected product to be marketed, however the finance division needs to provide input on the elements of NPV and Break-even-analysis so that these aspects are considered in a new product's life-cycle.

The concern here is with the **manoeuvrability** of the organization, which depends on the creation of the right conditions to foster flexibility. However, with flexibility and the decisive nature of emerging technology, structure and culture can possibly

become barriers to change especially when new technology needs to be immediately utilised.

In recent times incumbents need to develop and sustain the potential of being receptive and responsive to changes in customer needs and the external environment. The feedback from the market needs to be fed back into the strategic planning processes that are at this stage, very dynamic. This creates immense pressure on the learning & knowledge systems of an organisation.

Management's ability to process information and sense the environment allows it to create more and better routines reducing the likelihood of radical change and increasing the predictability of the organisation's behaviour. At the other end, occupants in the industry are technology driven and have to some extent benefited from the convergence of information technology and telecommunications. These elements have now arguably simplified the adoption rate of new routines within the organisation. However, the pioneers in the communication industry have potentially built up some elements of complacency and routine rigidness that can influence it's flexibility.

2.3 Summary

This chapter has established a business case for this study in terms of identifying and unravelling a number of business related issues that need to be addressed to achieve organisational benefit. Arguably, an understanding of these issues as unravelled here needs to be achieved through this research. The issues opened up here will thus serve as input into the research instrument in which a questionnaire is used to acquire responses from a population sample that are actively participating in the industry.

Chapter 3 - Literature Review

3.1 Introduction

The theoretical concepts that were discussed in Chapter 2 have opened up a number of issues that are relevant to this study. The aim of this literature search is therefore to further unravel the problem from an academic perspective. The building of the academic case in this chapter provides an overall assessment of a selection of texts which is a useful reflection of this study.

This literature review is divided into 3 areas that are related to the objectives of this research study. The themes that will be uncovered academically are,

- Innovation
- The Management of Knowledge in Organisations
- The Organisational Elements

3.2 Innovation

Rogers (1998) described innovation as the process of commercializing or extracting value from ideas. Innovation takes place in many ways and in many different circumstances. Damanpour (1991) indicated that the adoption of innovations from the manager's perspective is concerned with the generation, development, and implementation of new ideas, products (physical goods/services), technologies, structures, and administrative systems. In the context of an organization, an innovation refers to adoption of an internally generated or purchased device, system, policy, program, process, and product that is new to the adopting organization as a means of changing an organization; multiple innovations are intended to make a contribution to the performance of the adopting organization. Although numerous innovation typologies exist in the marketing and management literature, Damanpour's (1991) suggested there are two major innovation typologies relevant to marketing: (1) technical and administrative innovations and (2) radical and incremental innovations. Technical innovation refers to adoption of new technological advancement in producing products (physical goods and services) within the adopting organization. On the other hand, administrative innovation is concerned

with organizational structure and administrative processes and defined as adoption of a new structural or administrative process by the adopting organization. Tidd (2001) highlights that there are four broad categories named the 4 Ps of innovation:

• Product innovation. The product or service itself is changed. A new type of toothpaste, a new diaper and a new insurance package are all examples of a product innovation.

• Process innovation. The way the product is being developed, produced and delivered is changed. New manufacturing equipment for diapers or new office procedures for an insurance firm would be process innovations.

• Position innovation. The context in which the product is introduced changes. The rebranding and repositioning of some types of medicine as health drinks for the fitness sector, is an example of a position innovation.

• Paradigm innovation. These are changes in the underlying mental models of what the firm does. In newspaper business, Metro challenged the competitors by giving away the newspaper for free.

Tidd (2001) also notes that the difference between product and process innovations is not strict and what is a process innovation to one company can be a product innovation to another. A new jet-powered ferry can be both a product and a process innovation depending on what the circumstances are (e.g. if it used by ferry manufacturers or used by a ferry company).

The terminology to describe the detail of technological discontinuities, and the resulting disruptive technologies that have evolved from them, may be a relative new issue, the concept is not. Smith (1776), an 18th century economist who is famous for the publication of *Wealth of Nations* in 1776 discussed the principle of the division of labour, i.e. breaking down the production process into the smallest number of discrete steps in order to maximise the efficiency of operations. His concept highlighted the fact that this would transform the principal aspect of product based manufacturing that led to a centralised factory system that would re-shape the concept of manufacture and operation. The concept of breaking down the production process into separate tasks and activities would create the environment required for factory automation and increased volume output, which led to the replacement of the

domestic process of independent human skills and labour activities to achieve end-to-end manufacture.

Schumpeter (1942) commented on business failure through the publication of Capitalism, Socialism and Democracy where Schumpeter described “the Gales of creative destruction” that is brought about by radical innovation that will allow certain organisations to gain the competitive advantage and result in old organisations in established industries to perish if they could not weather a particular storm of creative destruction. Schumpeter (1942) does note that new concerns or industries that introduce new commodities or processes are likely to displace older, established industries. The common characteristic in Christensen’s (1997) definition is that disruptive innovation “attacks from below” i.e. the target segment to disrupt is the cost conscious types. However, according to Utterback and Acee (2005) disruptions do not only occur through products that are cheaper and perform equally well or worse on traditional performance measures. Utterback and Acee (2005) indicated that disruptions that happen within all kinds of products are questionable. The digital camera, for example, has of course disrupted the market for standard film cameras. The authors claim that the cost of the digital camera is higher than for film cameras; however, the cost of the actual camera is not what is important. The important cost is the cost of sharing photos with friends. This can be done by developing photos and by sending them electronically. Sending the photos electronically of course requires no cost at all, assuming that the necessary infrastructure is already in place. Furthermore, since you can erase photos easily with a digital camera, the cost of developing a photo with which you are satisfied is also lower for digital cameras.

Kotler (1999) and Henry (1989) indicate that radical innovation occurs through the interaction of the science base, technological developments and the needs of the market, However Freeman (1994), Drazin & Schoonhoven (1996) & Levitte (1980) disagree with the elements that influence innovation and signify that it is the internal processes that impact the organisations capability to innovate. Kotler (1999) further indicates that an organisation has 3 choices to commercialise a product,

1) First Entry – The first firm entering the market usually enjoys the ‘first-mover-advantages’ of locking in key distributors and customers and gaining

reputational leadership. But if the product is rushed to market before it is thoroughly tested, the product can acquire a flawed image.

2) Parallel entry – The firm might time its entry to coincide with the competitors' entry. The market may pay more attention when 2 companies are advertising the same product.
3) Late Entry – The firm might delay the launch until after the competitor has entered. The competitor would have incurred the cost of educating the market. The competitor's product may reveal faults that the entrant can avoid. The company may also be in a better position to assess the size of the market.

According to Porter (2008) first movers have no guarantee of success. Porter (2008) also outlines some critical success factors that are associated with first mover advantages and disadvantages. The advantages include reputation, pre-empting an attractive market position, creating switching costs, assessing distribution channels first, locking in key suppliers, defining industry standards and establishing barriers. First mover disadvantages include pioneering costs, uncertain demand, coping with changing customer needs, irreversible capital investments, the effects of technological discontinuities and the appearance of substitute products.

Discontinuous innovations result in new products that involve dramatic leaps in terms of benefit; however this gives rise to very negative consumer reactions and behaviour in the market segment. Lynn & Reilly (2002) presented keys success factors for any product development process and then show how those factors relate specifically to radical innovation which they defined as an "innovation that uses an untested technology and creates a new market category". According to Christensen (1997) sustaining innovations are usually taken to market by the market leader, which therefore strengthen its position, while disruptive innovations are introduced by newcomers, which threaten the position of the established firm and lead to its failure. Christensen (1997) notes that the reason why low-end disruptions are hard for incumbent firms to handle is that they usually take place in the lower segment of the market. The established firm's processes and values are not appropriate for pursuing a low-cost business model, and the cost structure of the established company makes it impossible to develop low-cost products.

Tushman and Anderson (1986) concurs with Christensen (1997) where they indicated that innovations can be either competence-destroying or competence-enhancing. Tushman and Anderson (1986) signify that competence-destroying innovations are based on different technological knowledge or concepts, which make the firm's existing skills and knowledge irrelevant. On the other hand, competence-enhancing innovations build on existing know-how, these tend to reinforces the existing order within the industry, while competence-destroying types tend to overturn the existing operations of new firms.

The pattern of success followed by failure does not plaque all organisations. To overcome this issue, organisations are faced by challenges of Dualism. Dualism is defined as an organisation performing efficiently today while innovating effectively for the future. According to Roberts (1990) organisations will find challenges in carrying out dualism in highly competitive markets. This is perhaps due to the fact that there are only incremental modifications on existing products to meet market leadership and demand. Dualism will also be propagated down the command line, a top-down approach according to Roberts (1990), but Christensen (1997) states that it can originate at any tier and department/division within the company. Traditional management theories are concerned with the efficient utilization, production, and distribution of products and services. Operations and day-to-day responsibilities are predominant. The organisation, in essence does not devote time to thinking and learning about strategy. Handy (2002) also indicates that organisations need to build parallel structures and activities that would permit the forces of today and tomorrow to co-exist, that is processes that allow dualism. The two forces are known as upstream and downstream types. Downstream types are focussed with technical support for problems with the current products and in addition getting new products into the marketplace. Upstream forces are concerned with all the possible core technologies that act as future product enablers. A note here is that these two forces are competing with each other for resources in the organisation. Management therefore has to mediate and prioritise differences that arise in this particular type of behaviour. If the downstream forces are dominant then the sacrifice of using future technology in product development will be overlooked to meet tight schedules and market demands. These result in longer-term, forward looking goals and projects are sacrificed from shorter-term types. Another effect of this is that important

technological changes in the marketplace or niche applications go undetected by an organisation. At the other extreme, if research or upstream forces dominate, then the business is allowed to dominate work within R&D.

Chandy and Tellis (1998) argue that firms that dominate markets are often reluctant to foster radical innovation because they are unwilling to cannibalise their own investments and assets until it is too late. Christensen (2003) notes that although substitution of existing products and markets mainly applies in a later phase of the process, due to the initial sub-optimal state of the disruptive innovation for existing markets, it may affect early management decisions. Brown (1998) argues that the greatest difficulty a company encounters is the challenge to the architecture of a company's revenues when it attempts to introduce a technology change. This kind of change is the hardest for corporations to accept and act on. According to Chandy and Tellis (1998), especially in the case of successful and dominant products, processes and business models, people remain committed to their earlier decisions and tend to justify their prior decisions to themselves (self-justification) and others (save face). According to an extensive research study by Deloitte Research (2004), established companies are focused on short to medium term growth and so try to protect their current products. In some industries, senior management of Kodak, AGFA and ford hesitated too long in cannibalising their chemical film processes with innovative but initially higher cost per print digital printing technology. Wind and Cook (2005) also indicates that just because its current business model had been so successful, Motorola continued building analogue wireless phones at a time when the industry had turned to global digital standards.

Large companies are very active in creating new ideas, but the problem arises when a decision has to be taken in terms of investment of funds and resources into them. Justification of expenditure is the familiar basis that many senior and executive managers consider before any action of sponsorship is taken. However decisions regarding market research on the other hand are relatively much easier to justify and defend. Morone (1993) identified that a combination of radical and incremental innovations lead to success. Lynn, Morone and Paulson (1997) highlight the fact that discontinuous innovations through new product development ensure success ,

whereas extensions to existing products leads to market leadership, this leadership can only be achieved after the product involves a discontinuous innovation.

Kotler (1999), Barrett (1996) and Urban (1993) debate that to reduce large scale losses, market research is a fundamental aspect of any organisation. Many products fail in the market due to the fact that they do not meet the consumer's basic need. Barrett (1996) established that 80% of newly launched products fail to impact the market after two years. Management theory shows that these types of market risks can be reduced by applying a diligent plan of market research, as a key driver. Barrett (1996) further signifies that if this approach is adopted by organisations then the chances of failure is non-existent. Roger (1995) also argued that discontinuous innovation implies that there is no market for a product, therefore potential consumer research may result in high negativity. Roger (1995) further debated that consumers are not aware of their future needs, in other words they lack product foresight. This leads to a problem where King (1985) identified that market research can tell you what people did and thought at that point in time: it can't tell directly what might happen under a new set of market conditions. New products are always viewed by consumers in reference to past experiences with similar types. Roger (1995) states that customers require time to learn and experiment with new products. This raises the issue of how to deal with consumers with limited past knowledge and the ability to gather relevant market information in terms of research. Lynn (1997) suggests that trial and error be employed, whereby the organisation probes and learns by experiences in the market. Barrett (1996) differs in this sense that, this should not be trial and error but experimental design and exploration in terms of valuable experiences and incremental modifications done to satisfy consumers. Levitt (1980) agrees with Barrett (1996) and also indicates that the product should however have a clear distinction between value-added benefit and core functionality. Trusted management theory has also shown that to become profitable, an organisation has to consider the needs of the customer. Many have evolved to a stage that involves the customer as a co-developer.

According to Piatier (1984), a barrier to innovation is any factor that influences negatively on the innovation process. Positive influencers are called facilitators of innovation. Barriers are also known as obstacles, constraints and inhibitors. It must

be noted that facilitators can turn out to be barriers and vice-versa as the organisation changes over time or as the external conditions evolve.

Frost and Egri (1991) discovered that any resistance to innovation by staff and management is seen as a barrier. King (1990) disagrees with this statement as sometimes the resistance may actually be a positive action that saves an organisation from making a uniformed decision. Barriers can be classified in a number of ways. They are usually based on its original source. The most popular classification is types that are internal and external to the organisation. Piatier (1984) noted these as endogenous and exogenous respectively. Jorde and Teece (1990) identified that know-how leakage and other activities of duplication can act as barriers. Patents and copy rights are required to protect organisations, however leakage occurs at the very early stages of the of idea conception. Supply and demand issues may also present themselves as barriers. Storey (2000) identified 'short-termism' as the effect of pressure from, e.g. the stock exchange market on public organisations. The effect is that many innovation projects with a long-term payback period are often ignored by the organisation but are critical to its future survival. Increases or decreases in foreign exchange rates can also impact the Net Present Value calculations and projecting revenue on specific innovative projects. Piatier (1984) highlights the most popular barrier as being financial. The high risk associated with radical innovation influences decision making by sponsors and lenders negatively, as there is no willing investment. Tidd (1997) also indicated that external barriers may also surface at the inter-organisational level where the organisation has to co-operate at the regional, national or international level . He further highlights that these barriers can occur along the supply chain when distribution channels are problematic for a new organisation. Customers' negativity and reluctance of product change can also be an inhibitor. Many customers are quite content with the basic functionality of their products. These barriers surfaces when TP caters for better products but MP inhibits it.

Preissl (1998) stated that organisations are hesitant of planning projects as regulations may add the high uncertainty of time, cost and risk association. The possibility exists that regulations can place unnecessary limitations on the operations of an organisation. An important note is that regulation can act as a facilitator in some industries and an inhibitor in others. Jorde and Teece (1990) identified labour

and consumer protection legislation, environmental regulation as some legal constraints. The legal protection of an organisations Intellectual property structure is quite a contentious issue as any loopholes allow innovation to be copied and replicated. If an organisation has invested large amounts of money in a particular type of innovation and other cheaper methods allow it to be replicated by others, this can potentially cripple the organisation as noted by Chesbrough (1999).

Preissl (1998) noted that internal barriers are composed of the characteristics of the organisational members, the characteristics of the organisation, and the management of innovation as a change process. Hence according to Preissl (1998) and Piatier (1984) ,these can be easily classified into people/culture related, structure and strategy related. Barriers that are caused by perceptions, including bias and a lack of motivation and skills form part of an internal category. The alignment of organisational and personal goals can also be characterised here, according to Markham & Aiman (2001). For example people that are experts in their areas may feel threatened by the changes that result from innovation. This forces the company to rely on 'champions of innovative change' to promote the change aspect. The absence of these champions can be an inhibitor as discovered by Gemuenden (1988) and Hauschildt (2003).

Hendry (1989) indicated that the lack of commitment of top management to innovation, the acceptance of risk taking and a high rate of innovative failures are amongst the top rated barriers to innovation. Schoemaker and Marias (1996) also state that decisions made by top management that are governed by beliefs and values regarding procedures and rules are also major barriers. Staudt (1994) also referred to the lack of suitably qualified personnel as a barrier which compliments Leonard-Barton (1995) view, in that core capabilities can turn into rigidness during technological change in which organisations trap themselves into the status-quo. Tang and Yeo (2003) highlighted competence barriers are a result of a lack of creativity and new knowledge required for innovation.

3.3 The Management of Knowledge in Organisations

Johnson, Jensen, Lorenz and Lundvall (2007) argued that the current world economies are based on knowledge and also the way that companies use knowledge to support innovation. Johnson *et al*. (2007) indicated that there are two learning modes. These are Science, Technology and Innovation (STI-mode) and Doing, Using and Interacting (DUI-mode). Johnson et al. (2007) also state that the STI-mode of learning was the dominant form of learning for large companies. However, according to Nelson (2003) engineers need to understand how things work without understanding why. This shows a dependence on DUI-mode for innovation. Johnson et al. (2007) agrees with this as it is believed that DUI-mode knowledge is gained by 'on-the-job-duties' as problems are faced on a day-to-day basis.

Shauen (1990) defined core competencies as, a set of differentiated skills, assets, and routines that provide the basis for an organisations competitive capacities and advantage in an industry. Mitchell (1989) observed that industry specific competencies increase the chances a company will experiment with new technology, in that the company will view the core-competencies it possesses in one sector as being transferable to another new opportunity in that same sector. It is believed that the core competencies are institutionalised in that they become part of the organisations shared reality, which occurs as a result of the chosen decisions over time.

There is evidence that, what an organisation believes it can do well plays a major role in the disruptive innovation space. Cooper and Smith (1992) studied 8 new entrants and 27 incumbents. The new entrants were studied during the introduction and rapid growth phase of development, with each industry involved in the development and sale of a major innovation. That nature of the innovation studied was such that while the incumbents were accustomed to using their existing technical competencies to develop, a new set of skills were required. In essence this brings forward the issue of expertise that the organisation relies on to remain competitive in a changing environment. New entrants needed to build on their existing skills in order to be successful, or look to gather these capabilities from other sources through other acquisition or technology legal contract and licensing.

Kline (1996), Morone (1993) & Pavitt (2000) indicate that there is generally a misunderstanding of the differences between core-competencies and technological capabilities. It is argued that core capabilities are required by an organisation just to perform its business functions, while competencies surface when organisations are able to combine and generate value through multiple technologies. Capabilities are important for business success, but it's the core-competencies that create the innovation and competition gap between organisations in the same industry. Core-competencies do not just represent technological capabilities, as they also require an understanding of how to exploit the specific technological knowledge in order to generate commercially viable products.

Dyerson and Pilkington (2005) highlighted that core-competencies can become inhibitors to organisations that are entering in new technological areas of operations. Leonard-Barton (1992) observes that what can be regarded as a competency in one area of business, can become rigidity when used in another area. It leads to the freezing of the organisation so it is unable to learn new methodologies or competencies that are outside of its base of expertise and skills. This element aligns with the studies of Wilson, Hickson, and Miller (1999) that showed that organisations choose irreversible decisions that are based on the belief that all success is due to past knowledge and competencies. Wilson *et al.* (1999) studied the issues of over-familiarity within an industry that leads to overconfidence, and how this over-familiarity drove organisational failure when applied to different process innovations. Grinyer and McKiernan (1994) used the term "hubris effect" to describe how successful managers develop pride in their particular way of doing activities and assume that their established methods of operation will always work in the future. This result of over-confidence is related to the fact that managers are just too familiar with the business and not questioning their decision and actions until it is too late and substantial commitments have already been made with respect to innovations.

Core competencies are inherent in the organisation’s routines and procedures. Langlois (1997); Nelson & Winter (1982) & Langlois & Robertson (1995) refers to the issues of organisational perception/cognition and the roles these factors play in the ability of corporations to succeed or fail in capitalizing on new technological opportunities, or to effectively recognise potential disruption. Langlois (1997)

indicates that the structure of the organisation can be represented as a network of interconnected nodes that form the overall cognitive framework of an organisation, where information is passed through this cognitive structure, however, there are times when the information being transmitted goes through undetected and without interaction. The accurate detection of technological opportunities, and the potential profitability of them, therefore has an impact on how well the organisation perceives industry information. The misconceptions of incoming information can result in inappropriate technology choices that are applied to the market or the devising of strategies that fail when dealing with disruptive innovation.

Routines are necessary for the organisation to determine what information the organisation will see as meaningful and how the organisation will learn, and how it will evaluate business technical opportunities. Sull (2006) indicates that routines, like core-competencies can become an inhibitor by leading organisation's to overlook attractive alternative innovation trajectories, in favour of current operating procedures. In effect the organisation reframes and references all existing problems in terms of its existing core-competencies, routines and procedures, and the way that information is processed and analysed.

Christensen and Raynor (2003) noted that the reason why incumbents face the problem of ignoring disruptive innovations lies in the *processes* and *values* of the firm. The processes are the patterns of interaction, coordination, communication and decision-making through which companies transform resources into products and services. According to Christensen (1997), the most crucial processes are the processes that support investment decisions, e.g. market research and processes for financial projections. The processes of a firm are meant to be efficient for the current tasks, but they are not meant to change. Therefore, the conventional processes of an established firm are not suitable for disruptive innovations. Moreover, in low-margin segments where disruptions start, the established firm with its overhead costs finds it hard to earn money. The company then undertakes development in order to satisfy the needs of their existing customers. However, the existing customers are not likely to have the same needs as a niche market segment. This niche market segment, however, could turn out to become the most

important market segment in future, but still incumbent firms usually ignore this low-profit-looking market.

Organisations that want to carve out a competitive share in their current or even in a new industry need to be innovative. “Leading enterprises are applying knowledge management to leverage their intellectual assets and drive innovation” (Gartner, 1999). Innovation, however, cannot happen without people with the necessary knowledge and they, the knowledge workers, add value through their ideas, innovation and judgment (Botha, 2000). Grant (1996) emphasised knowledge application and the role of the individual. He postulates that knowledge resides with the individual and that the primary role of the organisation is to apply and integrate the knowledge of the knowledge workers. According to Grant (1996) ,the main contribution of the knowledge-based view is the recognition of the high costs of consensus decision making given the difficulties of communicating tacit knowledge. The premise of Grant’s (1996) view is based on the assumption that when it is business as usual, operations must run efficiently and effectively. He admits, however, that when there is a crisis within the organisation (e.g. disruptive or radical change) then this individualist routine mode will switch over to a group problem-solving mode where the decision making of unusual, complex, and important tasks will move to teams.

Nonaka and Takeuchi (1995) proposed a theory of Knowledge Creation as the building block for innovation. The creation of knowledge from within the organisation; on the contrary, is deemed to be the cornerstone of innovation and not the reactive processing of information from the external environment. They postulate that the key to knowledge creation lies in the mobilisation and conversion of tacit knowledge. The knowledge creation framework of Nonaka and Takeuchi (1995) shows that the process flow starts at the individual level within the organisation; moves through the organisation contributing to the establishment of an organisational memory and returns to the individual level, but now on a higher plane. This does not mean that the organisation operates in a closed system. Nonaka & Takeuchi (1995) still note that the organisation is still open to knowledge exchanges with the external environment. Grant (1996) had quite a different view as compared to Nonaka and Takeuchi (1995). He postulates that knowledge resides with the individual and that

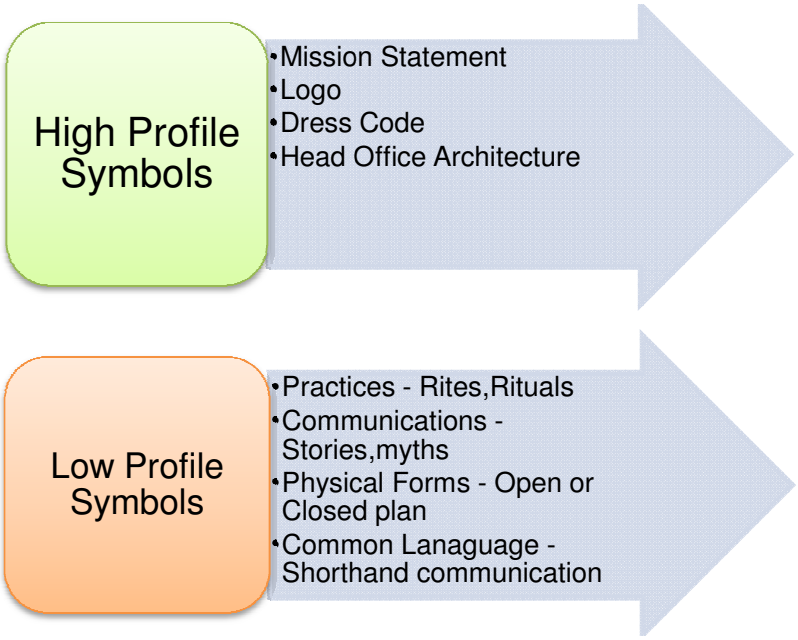
the primary role of the organisation is to apply and integrate the knowledge of the knowledge workers. Nonaka and Takeuchi (1995) pointed out that one should understand that there is a significant difference in terms of the explanations of competitive advantage (Porter's (1985) work) to the resource-based theories (core competencies, skills and capabilities). They proposed that this regime is required in the new technology age. Carneiro (2000) also agrees with Nonaka and Takeuchi (1995) in that knowledge influences competitiveness and is the main source of intellectual assets. Canreiro (2000) proposed that management should purposely organise, motivate and control the development of their knowledge workers.

Sinkula (2002) and Baker & Sinkula (2002) defined unlearning as the process by which people and firms eliminate old logic (test the validity of their beliefs and discard the present way of doing something) and substitute it with something fundamentally new. The ability to unlearn is one of the most critical competencies people require to overcome pre-judgement and obsolete mental models, key barriers to disruptive innovation and in effect limiting the technology over-reliance. Argyris (1996), Baker and Sinkula (2002) & Senge (1994) states that unlearning is central to higher order learning: the capability and application of generative and meta-learning and challenging assumptions. It must take place both at the individual and at the organisational level. Sinkula (2002) also highlighted that most (organisational) unlearning is problem-driven, and is set in motion by some external shock to the organisation. Sinkula (2002) & Senge (1994) also denote that the ability to sense when unlearning efforts should be initiated seems critical. The inability to unlearn, to break through the barriers of conventional thinking, and to discard out-dated beliefs hinders the shedding of obsolete mental models. This influences, for instance, the way market information is collected, interpreted and acted upon. Wind and Crook (2005) also indicated that if core assumptions are not examined, correct interpretation and unlearning are inhibited. Apple Computer's outsider status in the music industry gave it an independence of thought and action that allowed it to do what the music industry itself apparently could not do – sell single songs rather than CD albums.

3.4 The Organisational Elements

According to Wilson and Rosenfeld (1990) organisational culture is the basic values, ideas and assumptions which guide individual and business behaviour. Wilson and Rosenfeld (1990) further indicate that these values are displayed in elements such as stories, language, jargon, office layout and dress amongst staff.

Figure 3-1: Culture Symbols



Tushman and O-Reilly (2002) argued that culture is an effective way of controlling and coordinating people without the need for formal control systems. Christensen & Raynor (2003) and Hendersen (2006) also indicate that when great changes such as disruptive innovation occurs, organisational culture generates cultural inertia which is so difficult to overcome directly that it is a key reason why managers fail to introduce timely and substantial change even when they know that this change is required.

Schein (1992) observed that group members have a need for cognitive stability and consistency, and any challenge or questioning of basic assumptions will result in defensive behaviour from the group membership. In this way, the shared basic assumptions that combine to form the culture of the group can be regarded as a set of cognitive defence mechanisms that permit the group to continue in the face of change, uncertainty, or potential disruption. Argyris and Schoon (1996) also indicate

that the shared basic assumptions become part of the publicly shared strategies, goals and group philosophies that become the articulated values of the group. Schein (1992) signify that these values, through repeated use and historical success, become transformed into the unwritten assumptions that are supported by a shared set of beliefs, norms, and operational rule of behaviour These set of values that become the core behaviour of the organisation can, therefore serve as a guide and methodology for dealing with uncontrollable events and stressful situations. Christensen and Raynor (2003) also viewed the values of a firm as something that guides prioritization decisions. The values of the firm therefore shape the resource allocation process. In big firms the values (i.e. growth ambitions) lead employees to favour projects aimed at big market segments. Small niche segments normally cannot promise to satisfy the growth ambitions of the established company.

Louw and Venter (2006) defined organisational structure as the pattern of interaction and co-ordination that links individual tasks into group activities that leads to the organisation's goal. Organisational structure also covers the size of a firm. Christensen & Raynor (2003) also showed that in high-tech industries, the size of the firm is negatively correlated to the success of the disruptive innovation. Organisational structure affects the culture and behaviour of members during the innovative process. It is also very closely related to the decision making and problem-solving capacity of the organisation. Hauschildt (2003) noted that structural change obstacles are characterised by ineffective communication channels, insufficient benefits & rewards systems and sub-cultures with different obstructing departments. Hitt (1993) summed this up by proposing the lack of inter-functional integration as a major change barrier. This becomes evident in the lack of collaboration between the marketing and R&D departments which is a true requirement for product innovation. Hendry (1989) indicated that different values, motivations and goal alignment between various departments in imperative for successful innovation. Henry (1989) also suggested that the centralisation of power in an organisation affects innovative negatively. Burns and Stalker (1961) indicate that the mechanistic structures with rigid hierarchy act as barriers as well. Formalised procedures and the ability of the organisation to become agile in changes are also noted by Schoemaker and Marais (1996) as inhibitors to change in technology.

According to Bass and Avolio (1994) leadership is a process by which a person influences others to accomplish an objective and directs the organization in a way that makes it more cohesive and coherent. There are 2 defintions of the leadership process,

- Influencing people in ways that are acceptable to them, regarding certain core issues.
-Leaders are those who are expected to be and are seen as influential.

Bass and Avolio (1994) characterized transformational leadership as being composed of four dimensions: *intellectual stimulation, individualized consideration, individualized influence, and inspirational motivation*. Intellectual stimulation involves challenging followers to re-examine some of their assumptions and the status quo, encouraging problem reformulation, imagination, intellectual curiosity, and novel approaches. Individualized consideration focuses on followers' development. It involves showing respect and concern about their personal feelings, needs, initiatives, and viewpoints. Idealized influence involves setting an example or role model for employees to follow. It can be regarded in terms of behaviours and attributions). Inspirational motivation refers to identifying new opportunities, and developing, articulating, and inspiring followers of a vision of the future. The above definitions suggest that transformational leadership is positively related to followers' innovation implementation behaviour because it can increase commitment to change. Keller (1992) also suggests that leading professional employees might require more than traditional leader behaviours especially in R&D settings where quality rather than quantity is the primary performance criterion. According to Howell and Higgins (1990) the transformational leader may be effective in playing external roles such as boundary spanning and championing.

Many organisations are changing in the way that failures are accepted and risk-taking promoted. IBM management highlights that in order to be successful; it has to double its failure rate as failure is a prerequisite to invention. However according to Farson and Keyes (2002), while this may be acceptable to the organisation, it has a negative effect on the individual. Employees are terrified of failure, however Farson and Keyes (2002) indicate that 'failure tolerant leaders' are the executives that make

the difference through their words and action that help employees through the fear of failure and create a culture of intelligent risk taking that leads to consistent innovation. Farson and Keyes (2002) further signify that the essence of the fault tolerant leader is to ensure that employees are no longer thinking in terms of success or failure but instead in terms of learning and experience

Goleman (2000) discovered that the most effective leaders possess one crucial aspect, namely, a high degree of emotional intelligence. Emotional intelligence consists of the critical components that are, self-awareness, self-regulation, motivation, empathy and social skills. Goleman (2000) defines self-awareness as having an understanding of one's emotions, strengths, weaknesses, needs and drives. He further signifies that people with strong self-awareness are neither too critical nor unrealistically hopeful. This is very imperative in terms of innovative and creativity as these activities entails the making of mistakes and a certain degree of risk taking. Therefore leaders who are able to exercise strong self-awareness are more acceptable to mistakes without allowing employees to be under-valued or, experience decreased motivation through failure. Bass (1990) also indicates that self-aware people also have a good view of their capabilities, so that creating unrealistic expectations are thought out carefully. The ability to transfer the vision and mission, especially under change scenarios are also key here and can be managed by a self-aware leader.

According to Goleman (2000) effective leaders always have one trait, namely motivation which drives individuals to achieve beyond expectations. It is important to note that intrinsic motivation is the largest contributor to the performance of effective leaders who possess the energy to doing tasks better. Amabile (1998) also highlighted that creativity is fostered when individuals and teams have relatively high autonomy in their daily conduct thus fostering a sense of ownership and control over their work and own ideas. Oldham and Cummings (1996) also indicated that supportive supervision is an important determinant of intrinsic motivation and creativity at work. Oldham and Cummings (1996) further highlight that leaders who care for their employees' feelings and needs, facilitate their skill development, show them ways to achieve the goals and express confidence in them

According to Goleman (2000), socially skilled people have a wide circle of acquaintances with the added strength of managing diversity effectively. The social skill is also a real benefit in terms of knowledge, idea sharing and continuous learning that adds to the innovative climate. In change situations it is also imperative to influence people to a certain direction, the skill allows the development of supportive teams that can assist in facilitating this change. Goleman (2000) further advocates that this leadership trait is on the innovators part of the continuum as the trait has the ability to trigger constructive debate, energises and unleashes the potential of a group to cooperate effectively in problem solving. The communication and collaboration amongst individuals in the group also serves to strengthen the relationship between the members which is imperative in the generation of ideas for problem resolution. It generates the respect for each other ideas instead of the usual "shooting down" of ideas.

3.5 Summary

The aim of the chapter has been to provide the reader with a more comprehensive understanding of the current literature on the importance and drivers of an innovative organisation. Knowledge management and the internal routines and capabilities have been discussed as these aspects are necessary for change in respect of accepting emerging technology. The concepts of culture, structure and leadership are also viewed as potential elements that shape decision-making and technology choices in an organisation. This approach of building an academic case for the study has introduced the researcher to a further degree of complexity with regards to the problem. The additional literature has been reviewed to become familiar with the barriers that are created which seem to lock a technological organisation into a current era where further progression seems limited. This literature search will, therefore, further inform the research instrument (questionnaire).

Chapter 4 - Research Design and Methodology

4.1 Introduction

According to Leedy and Ormond (2005), Research is a systematic process of collecting, analysing and interpreting information (data) in order to increase our understanding of the phenomenon about which we are interested or concerned. Leedy and Ormond (2005) further advocate that, due to the data and methodology being interdependent, the researcher when selecting a methodology must always take into account the nature of the data that will be collected in the resolution of the problem.

This chapter defines the research design and methodology. The aim is to present the methods that will be used, and why they were chosen. The chapter also helps to give the reader an idea of how the research will proceed and be realised. In that respect, the method of data analysis and the sources to be used for data collection are also described.

4.2 Research Design

According to Coldwell and Herbst (2004), the research design represents the strategy to be followed in the study and includes the plan by which the strategy is to be executed. The research design is also termed as the structure of the research and forms the holistic perspective of the study and demonstrates how the different parts of the samples, measurements and methods work together to address the research questions and objectives. The design is also responsible for specifying the procedures for collection, measurement and the analysis of the data. Coldwell and Herbst (2004) also suggest that the design must be experimental in nature which assists in the acceptance and validity of the findings. This aspect is linked to the feasibility of the design, in which a good design must be able to be implemented.

The anticipation of potential problems of measurement and database construction must also be carefully thought out so as to proceed effectively with the investigation. The design must also consider potential access to information and the sensitivity around publicising this data. The necessary approval or stakeholders of the data

need to be notified about the study. By proactively gaining access to the necessary data sources, resources and time during the period of study can be saved. Confidentiality and Ethical issues also need to be addressed as soon as possible during the design. This will also provide the comfort to the researcher that the study will not have to stop midway through to retrieve the necessary information.

This study begun with an initial brainstorming session (Appendix 3) to identify a problematic area that displayed some symptoms to be investigated. An exploratory approach was adopted in this stage to perform an initial screening of the issue/s but lacked the actual depth to arrive at a problem statement. In the case of this project the business and academic area was discovered to be innovation. Since innovation involved new technology and products based on emerging technology, the concept of disruption surfaced as a result of a preliminary literature search. The brainstorm output was then enhanced at this point and a problem statement devised.

The substitution of technology was then viewed as an primary issue but very closely related to organisational change and competiveness. It was decided to use a fishbone diagram (Appendix 4) to further explore this complexity. The further review of literature allowed the formation of the research instrument and ability to delve deeper into the problem area by identifying some theoretical concepts that were applied in Chapter 2.This study was predominantly reliant on primary data that was then retrieved from the various industry occupants. The research instrument (questionnaire) was designed such that study was not heavily reliant on the retrieval of protected information, for example planning documents and other technical strategic specifications were not required. It was kept simple for the ease of understanding, but also considered the measurement and analysis of the data retrieved, for example some questions were paired to ease with statistical interpretation The access to other information was predominantly publicly available through the various network providers' websites.

4.3 Research Methodology

Coldwell and Herbst (2004) define quantitative research as generally involving the collection of primary data from a large number of individual units, frequently with the intention of projecting the results to a wider population. Coldwell and Herbst (2004) further emphasise that quantitative approaches to research essentially describes, infers and resolves problems using numbers i.e. the collection of numerical data, the summary of those data and the drawing of inferences from the data. Quantitative research therefore involves the verification of a hypothesis by the use of scientific methods i.e. a systematic collection of data (facts not opinions), and then the analysis of the data using scientific methods (such as statistical analysis).

Charlesworth, Lawton, Lewis, Martin and Taylor (2001) indicate that qualitative research can help to unravel complex issues such as issues affecting motivation and values, which are changeable and in other ways difficult or impossible to measure by means of mathematical techniques. What this suggests is that apart from quantitative research methods which involve larger sample sizes and numbers, there are problems that exists which involve people, opinions and feeling and which cannot be investigated quantitatively. Leedy and Ormond (2005) explain that a qualitative study can help define what is important, when little information exists on a topic, when variables are unknown, when a relevant theory base is inadequate.

A quantitative approach was adopted in this study due to the explorative and interpretive nature of this study. It was also discovered that employees in management positions had limited free time and preferred a short and concise method for information retrieval, hence this approach proved more practical to achieve in this set period of time.

4.4 Population and Sample

Coldwell and Herbst (2004) state that a population is the total collection of elements where inferences about it can be performed. The research findings can then be generalized to the entire population (Coldwell and Herbst, 2004).

Coldwell & Herbst (2004) indicate that the sampling frame is closely related to the population. It is the list of elements from which the sample is actually drawn. According to Coldwell and Herbst (2004) there are two kinds of sampling techniques. Probability sampling is based on the researcher's idea that the people or events chosen as the sample are representative of the entire population. Non-probability sampling is conducted without such knowledge. Sample Selection is important because it will influence the outcome of the research, and how the research findings can be applied.

The sample for the study will be specialists and management (i.e. probability sampling) within the telecommunications sector in South Africa. In this study, a probable sample will be chosen across the telecommunications industry in order to provide responses to a questionnaire. A minimum of 35 responses was essential to accurately meet the objectives of this study.

4.5 Research Instrument

Oppenheim (1966) advocates that once the sampling procedures have been set up to obtain the desired data, the next step is the design of the research instrument. Structured, semi-structured interviews and the issuance of surveys are 2 common instruments for data collection. According to Charlesworth, Lawton, Lewis, Martin and Taylor (2001), there are key aspects to consider in the designing of the research instrument for a study: (1) the method of approach to the respondent, (2) the formulation of the questions and in what sequence or order they are asked, (3) what response format is used and, (4) whether these are pre-coded or unstructured.

According to Charlesworth, Lawton, Lewis, Martin and Taylor (2001) a questionnaire is a systematic instrument for the collection of data, which ensures consistency through the fact that everyone, is asked the same questions. This method provides

the purpose to acquire information from people in a non-threatening way. Charlesworth *et al*. (2001) highlight that the main advantages of this method include, (1) Least cost to administer, (2) Easy to compare and analyse, (3) Sample questionnaires already exist. An important fact, however, is that the questionnaire needs to be designed with the consideration of the specific aims of the research.

Questionnaires allow the researcher to gather a significant amount of data at a relatively low cost. However one of the main drawbacks of questionnaires, especially ones issued through email, is often the low response rate. According to Saunders (2001) questionnaires also do not offer the researcher the opportunity to follow up ideas and clarify issues, which is one of the strengths of interviews. Saunders (2001) notes that questionnaires are not particularly suited for research that requires a large amount of open-ended questions, for which a structured interview might be a better instrument.

The research instrument to be used in this study is a structured survey, where a series of questions is posed to respondents in the industry. Charlesworth *et al*. (2001) indicate that in wording the questions, care must be taken to avoid asking questions that are insufficiently specific. Reflecting further on this, the data acquired may prove to have little validity if the questions are not specific to the goals of the research. Charlesworth *et al*. (2001) also state that care should be taken when using jargon and complex sentences i.e. the questions should be meaningful to the respondent. One should be aware of what level to pitch questions to avoid being patronizing. Coldwell &Herbst (2004) also state that the avoidance of influencing responses in a certain direction is also important – questions should be neutral The questions in this study will be kept simple and non-technical such that data can be retrieved from the various disciplines and business areas that are not necessarily technology dependent.

4.6 Data Collection and Analysis

Leedy, Ellis & Ormond (2005) indicate that data collection involves the participation of the researcher who poses a series of questions to willing participants; summarises their responses with percentages, frequency counts or more statistical indexes; and then draws inferences about a particular population from the responses of the sample.

Charlesworth *et al*. (2001) indicate that the data collection method must be chosen under the consideration of the problem being addressed. It must be suitable to the nature of the research, cost and time available to investigate it. However Charlesworth *et al*. (2001) state that in reality the data collection method chosen is often determined by the researchers overall mind-set or paradigm. This implies that the researcher often chooses methods that one is probably comfortable with or used to. The researcher must be aware of one's frame of reference as it can cause favouritism towards a collection method that does not necessarily address the problem but it is used because it was done before or form part of secondary data. According to Charlesworth *et al*. (2001), it is important to note that no data collection method is exclusive to either the qualitative or quantitative approach.

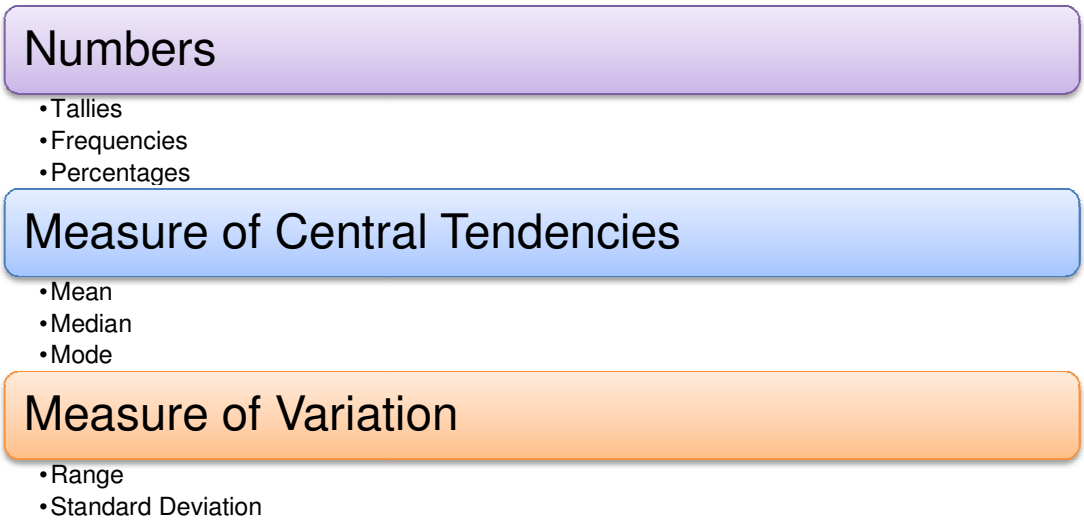
A list of questions will be circulated through an online survey to industry partners. The targeted Divisions will include Engineering, Products and Services, Customer Insight, Regulatory, Finance and Customer Care. A selection of as many technical specialists as possible will be an advantage because these employees are exposed in detail to communications technologies and their evolution. However the selection of the participant's involvement within the industry will be enrolled through an email channel to known people and then relying on a snowball effect to reach other participants.

Data analysis would involve categorisation of data, interpretation of single instances, identification of patterns and synthesis and generalisations. A likert scale will be used to measure the responses from the sample, the responses will be based on Strongly agree =1, Agree=2, Disagree=3, Strongly disagree=4.

Statistics is considered to be a mathematical science pertaining to the collection, analysis, interpretation or explanation, and presentation of data . Coldwell &Herbst (2004) state that it is the science of making effective use of numerical data relating to groups of individuals or experiments. Statistics also contribute to the planning of the collection of data, in terms of the research design, research methods and data types being collected.

Statistics can be decomposed into 2 categories, namely Descriptive and Inferential. Descriptive statistics is the term given to the analysis of data that helps describe, show or summarize data in a meaningfully way in order to generate certain patterns or trends that emerge from the data.

Figure 4-1: Descriptive Statistics



Descriptive statistics are very important, as it is capable of visually presenting large amounts of data for ease of interpretation. Descriptive statistics do not allow conclusions to be drawn regarding any generated hypothesis beyond the data that is collected, analysed and presented. Further to this every time one tries to describe a large set of observations with a single indicator, such as an average, there is a risk of distorting the original data or losing important detail. In this study descriptive statistics will be used to show the demographic data, frequencies and standard deviations. The information with regards to the awareness of disruption amongst

industry employees will be performed with descriptive statistics, and integrated with the relevant literature in order to demonstrate the objective. ***(Objective 1)***

Charlesworth *et al*. (2001) states that inferential statistics aim to make inferences from data in order to make conclusions that go beyond this data. In other words, inferential statistics are used to make inferences about a population from a sample in order to form assumptions and generalizations about the wider population. This statistical form also allows the prediction of future behaviour of the sample or population.

In this study, Correlations are used to investigate inter-relationships, especially between competiveness and the early adoption of new technology ***(Objective 3).*** Factor analysis is a statistical technique used to identify a smaller number of underlying dimensions, or factors, that can be used to represent relationships among interrelated variables, this technique is used to uncover the elements that prevent new technological transition ***(Objective 2).***

The SPSS(Statistical Package for the Social Sciences) software package is used to perform the statistical analysis on the retrieved data.

4.7 Reliability and Validity

Reliability is concerned with the research and results in terms of replication. Similar outcomes should be obtainable if the research is repeated. The prime objective of this research study is to understand current disruptive innovation problems in the industry and its relationship within incumbents. It is likely that another researcher following the same method with the same data would offer similar conclusions, even though the opinions of a different researcher would add a degree of subjectivity. This is because the review method is a summary, synthesis and collection of existing empirical internal and external information and data that is based on a known theme of disruptive technologies, thus reliability would be reasonably high. The questionnaire is based on known disruptive technologies and the closeness of

disruption to the incumbents; hence no secret or strategic information will be required or disclosed by industry participants.

Coldwell and Herbst (2004) indicate that the concept of validity refers to the probability that an assertion or finding is true. By reviewing research from peer-reviewed research journals, the validity of the data set would be quite accurate in representing disruptive innovation. The actual sample selection criteria will also help to strengthen validity as the subjects are selected from a wide range of disciplines within the industry.

Participation in the study was voluntary and participants were informed about the nature of the study prior to being asked to participate. Refusal to participate in the study was accepted at any stage during the course of the research. The primary data was treated as confidential information by the researcher.

4.8 Summary

This chapter described the research design and methodology that is adopted in the study. It has elaborated on the instruments used and the method which represents a means to accomplish the set objectives.

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Chapter 5 - Results and Discussion

5.1 Introduction

This chapter reports the results and findings of the study. The findings of this study will also be supported by, and integrated with the literature search of Chapter 3.The responses to the questions in each section of the study are grouped to facilitate the discussion and assist with the linking of the results to the research objectives. The objectives are,

1. **To gauge the level of awareness amongst industry occupants with regards to the disruptive nature of emerging technology in the SA Telecommunications industry.**
2. **To identify the primary determinants that causes incumbents to retain existing technologies.**
3. **To ascertain whether the early adoption of disruptive technologies will always lead to increased competiveness.**

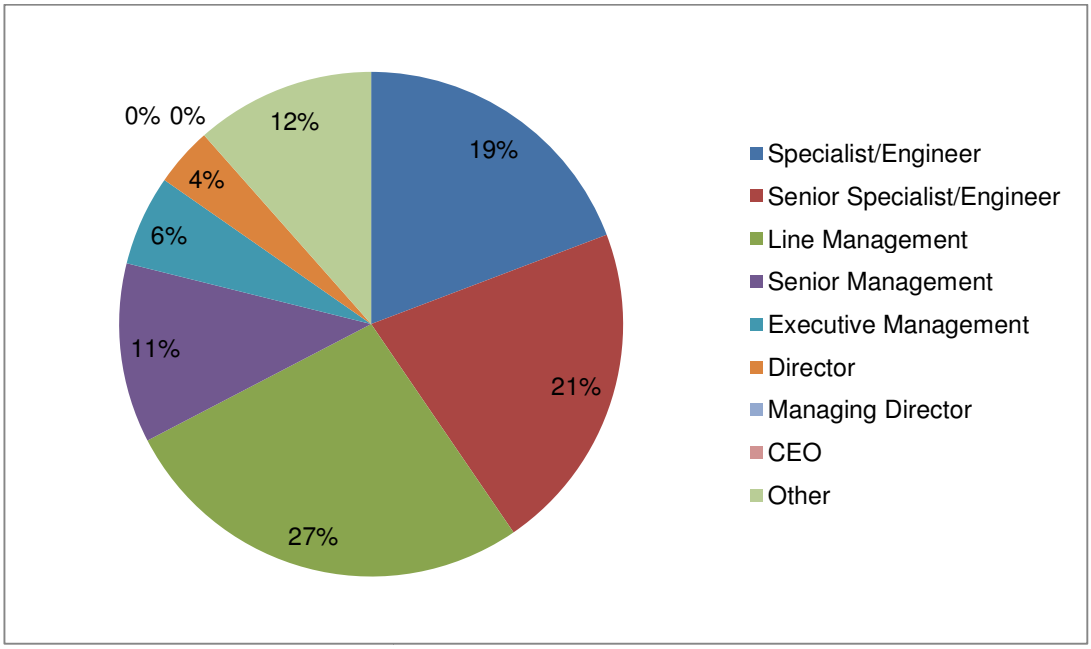
5.2 Demographics

The study aimed to get employees from the various network providers to participate in this survey. Reponses were received from 50 participants. The response rate was 77%. 74.5% of the respondents were male and 25.5% percent were female.

Figure 5-1: Age Distribution of Respondents

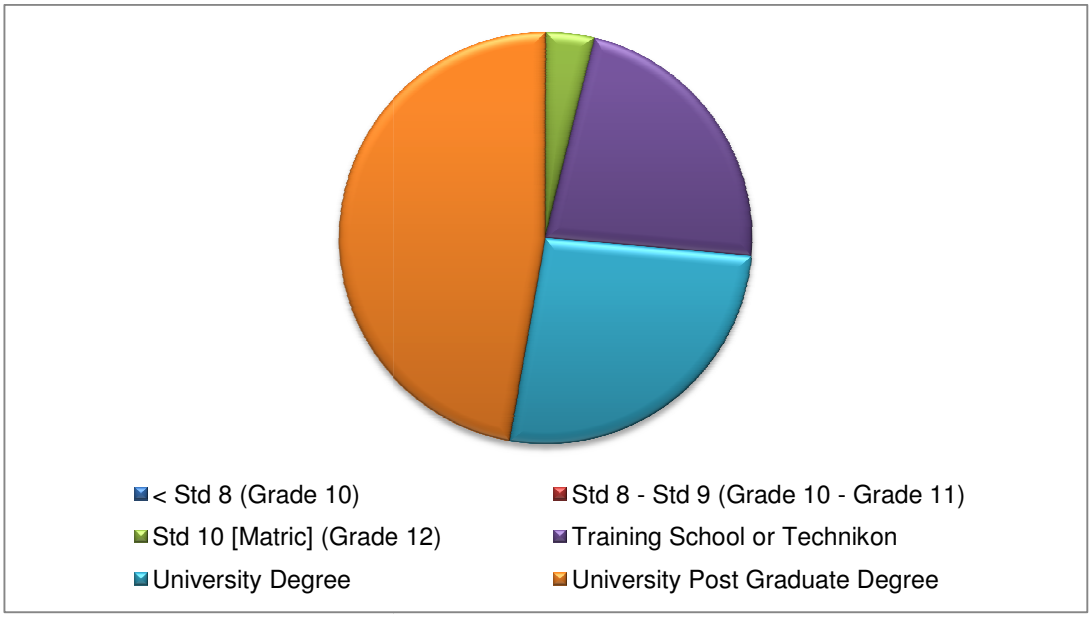
98% of the respondents were between the ages of 26 and 50, therefore this age bracket will be used with the comparison of other variables if required.

Figure 5-2:Respondent Position Distribution



69% of the respondents are employed within line management and specialist roles. This enriches the validity of the findings as technology engagement, choice and management is performed relatively actively at these levels.

Figure 5-3: Respondents Education Distribution



The levels of education contained in the sample are,

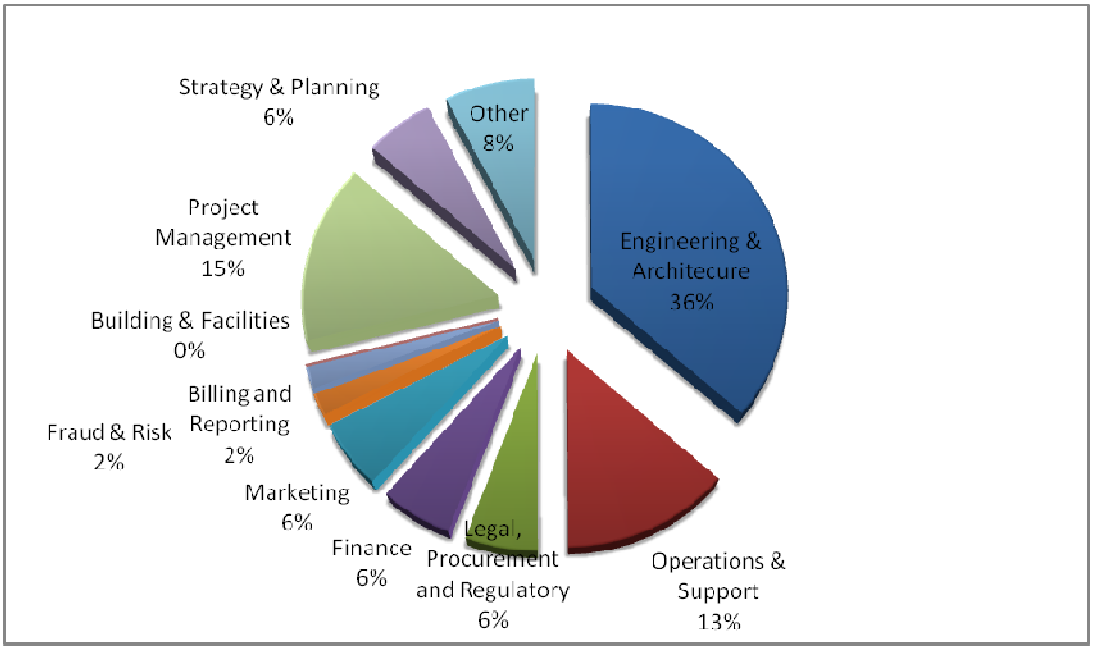
Matric [Standard 10] = 3.8%

Training School or Technikon = 22.6%

University Degree = 26.4%
University Post Graduate Degree = 47.2%

Therefore, when investigating the joint distribution with education levels, only levels from training school and above will be considered. The employment levels will also serve as a method of clustering responses.

Figure 5-4: Respondents Division Distribution



The nature of this study involves technology, innovation, marketing and Strategy. A total of 55% of the respondents are represented by the divisions that are in direct proximity of the problem area which increases the validity of the sample.

5.3 The Awareness of the Disruptive Nature of Emerging Technology (Objective 1)

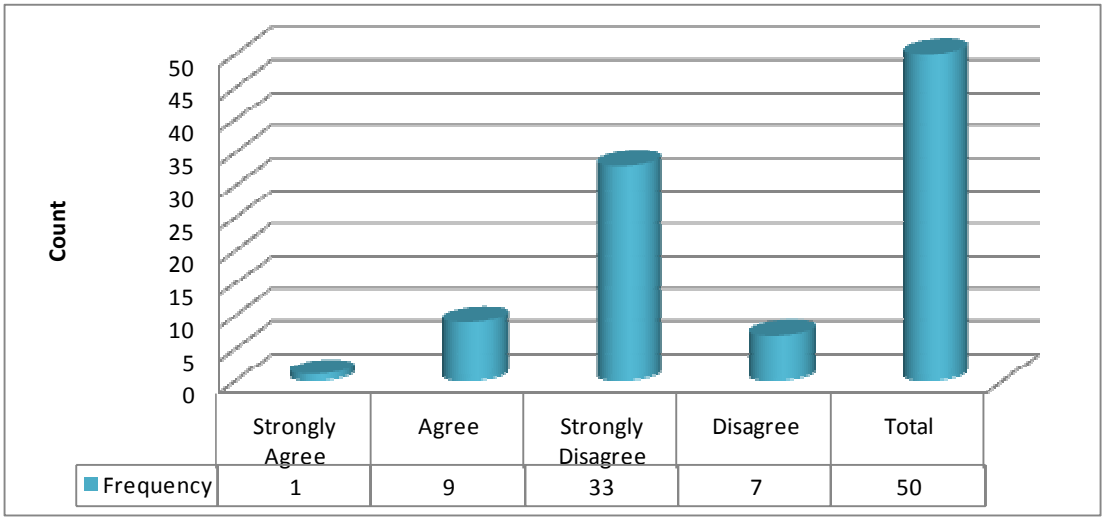
The aim of this objective is to investigate the level of awareness by industry players in terms of the disruptive nature of emerging technology in the SA telecommunications industry. The collected data was referenced against the definitions of disruption innovation as indicated in the literature search.

Table 5-1: Product Replacement

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	9	18.0	18.0	18.0
Agree	22	44.0	44.0	62.0
Disagree	17	34.0	34.0	96.0
Strongly Disagree	2	4.0	4.0	100.0
Total	50	100.0	100.0	

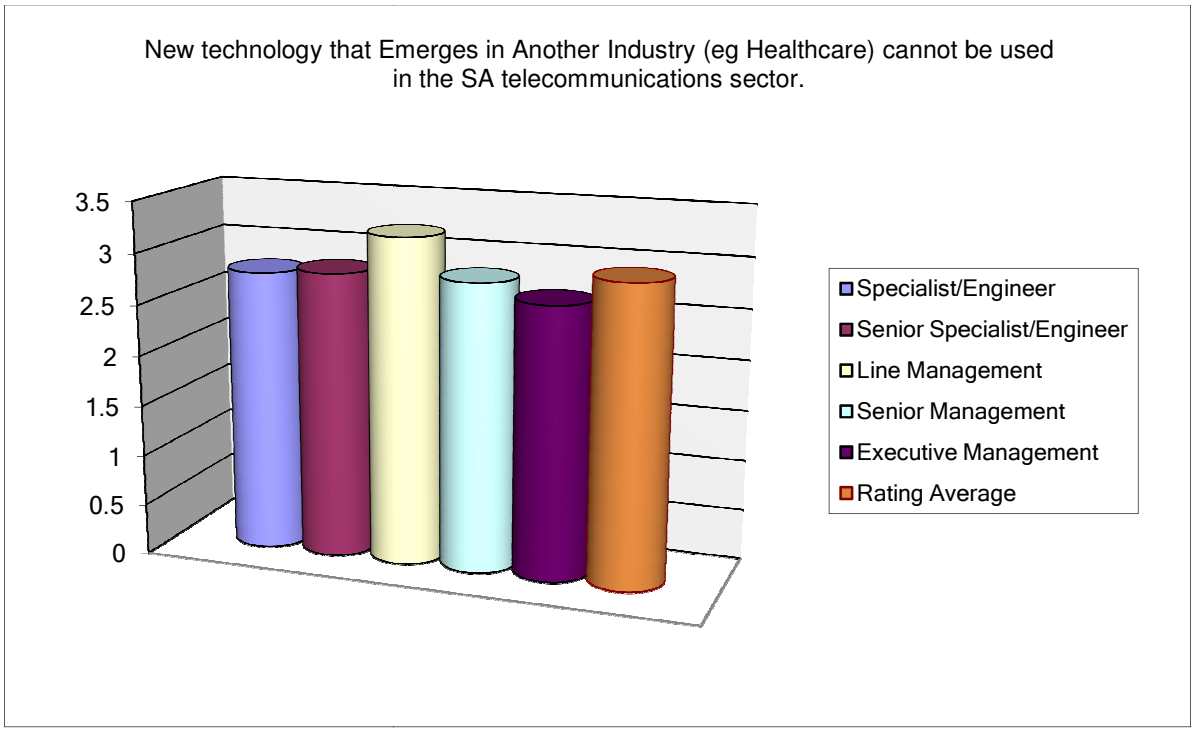
Chandy and Tellis (1998) argue that firms that dominate markets are often reluctant to foster radical innovations because they are unwilling to cannibalise their own investments and assets until it is too late.62% of the respondents agreed that the replacement of existing products is one of the biggest fears of the emergence of new technology; however 38% disagreed with this. A concerning aspect is that 32% of the 38% belonged to divisions that manage technology on a daily basis.

Figure 5-5: Response Frequency of Technology Surfacing in Another Industry



Tidd (2001) also noted that the difference between product and process innovations is not strict and what is a process innovation to one company can be a product innovation to another. The study shows that 66% of the respondents disagreed that new technology in the health-care industry cannot be used in the SA telecommunication industry; the mean of responses was 2.92. The cross-pollination of technologies across industries remains a mind-shift for many respondents, which is also emphasised by the fact that General Motors used their automobile competencies to revolutionise the steam train industry by developing the first diesel-electric prototypes. In Christensen's (1997) definition of disruptive technologies, this element of discontinuity surfacing across industries is the basis upon which disruption originates.

Figure 5-6: Employee Position Statistic



This view was consistent across the employment levels as shown in Figure 5-6.The business-as-usual concept of operations as adopted by management may present an attitude to resist and perceive innovation as being too risky. Hendry (1989) indicated that the lack of commitment of top management to innovation, the acceptance of risk taking and a high rate of innovative failures are amongst the top

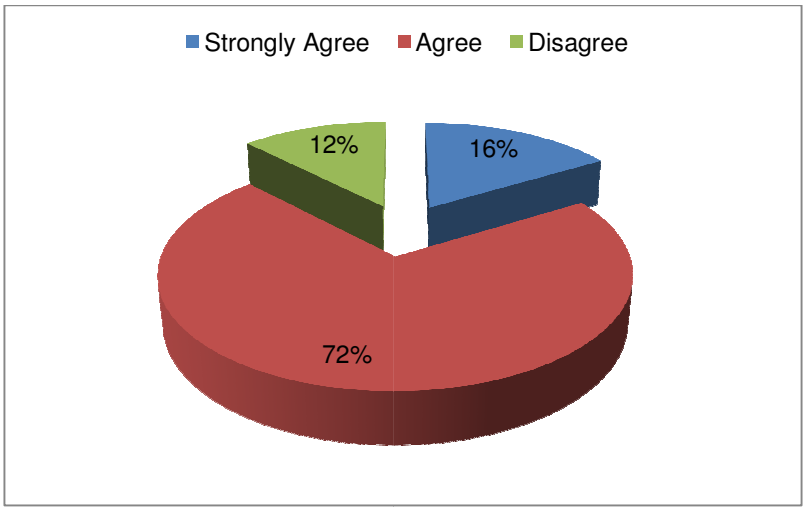
rated barriers to innovation. Schoemaker and Marias (1996) also state that decisions made by top management that are governed by beliefs and values regarding procedures and rules are also major barriers to the creation of new product ideas.

Kotler (1999), Barrett (1996) and Urban (1993) debate that to reduce large scale losses, market research is a fundamental aspect of any organisation. Many products fail in the market due to the fact that they do not meet the consumer's basic need. Barrett (1996) established that 80% of newly launched products fail to impact the market after two years. Management theory shows that these types of market risks can be reduced by applying a diligent plan of market research, as a key driver.

Table 5-2: New Product Functionality

		Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree		8	16.0	16.3	16.3
Agree		36	72.0	71.4	87.8
Disagree		6	12.0	12.2	100.0
	Total	50	100.0	100.0	

Figure 5-7: Graphical Representation of New Product Functionality



In the telecommunication industry 88% agreed that new entrants are able to sell their products to existing customers because they offer new functionality. An implication of this result on strategy is that this prompts the incumbents to adopt a technology push product development process. However, this raises the risk aspect that some functionality may not be adopted immediately by the customer base; an example of such a technology is IMS (IP Multimedia Systems). This adjustment in strategy and

processes needed by organisation show to a certain extent that new emerging technology is destructive in the industry in the longer term and is viewed as such by industry players.

Figure 5-8: Representation of New Entrant Statistic

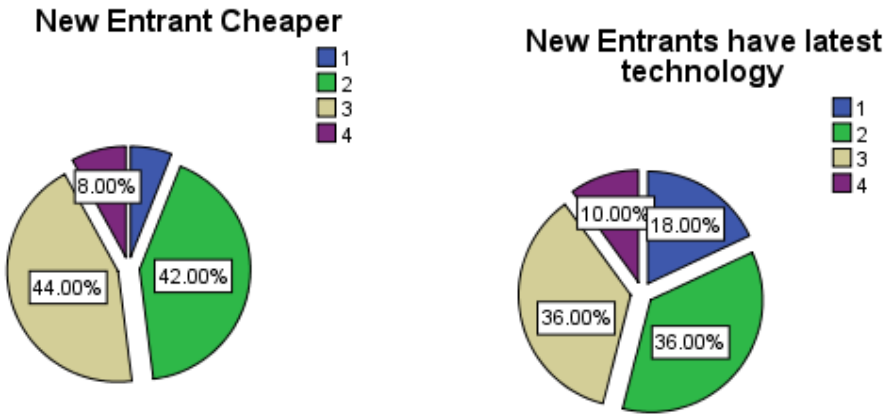


Figure 5-8 denotes that 44% of line management believe that new industry entrants are able to generate more revenue because they compete on price; however 36% of them also indicate that new entrants are able to create new market segments because they have access to the latest technologies. The common characteristic in Christensen's (1997) definition is that disruptive innovation "attacks from below" i.e. the target segment to disrupt is the cost conscious types. The relevance of this finding indicates that radical innovation in terms of cost and differentiation will be the main ingredients that will shape competition in the industry.

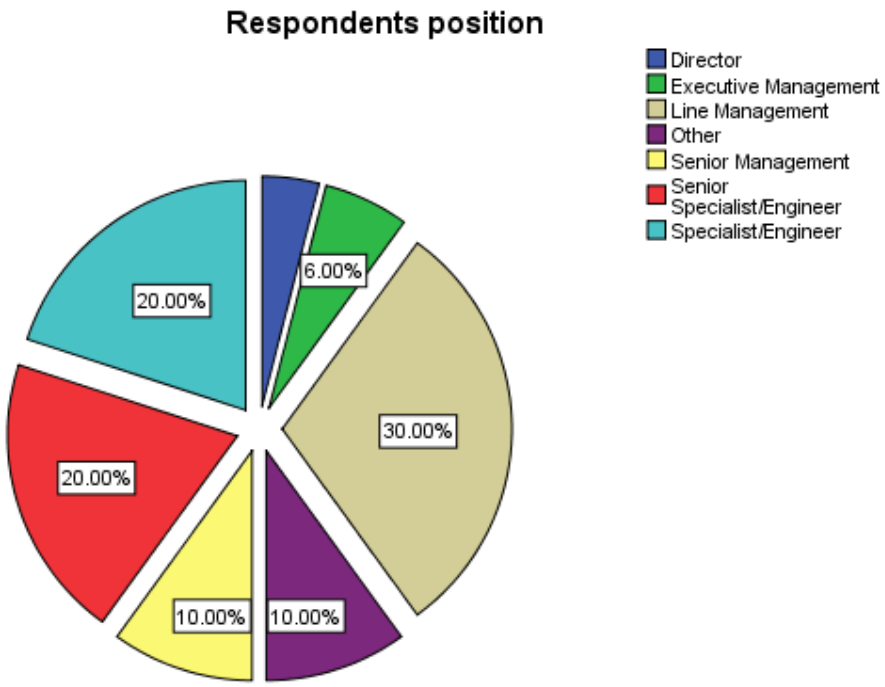
Christensen (1997) also indicates that sustaining innovations are usually taken to market by the market leaders, which therefore strengthen its positions, while disruptive innovations are introduced by newcomers, which threaten the position of the established firm and lead to its failure.

Table 5-3: New Entrant Advantages

		Frequency	%	Valid %	Cumulative Percentage
	Strongly Agree	9	18.0	18.0	18.0
	Agree	23	46.0	46.0	64.0
	Disagree	14	28.0	28.0	92.0
	Strongly Disagree	4	8.0	8.0	100.0
	Total	50	100.0	100.0	

64% of the respondents believed that new entrants have a definite advantage when new technologies surface in the industry. This is not explicit to pricing or differentiation strategies.

Figure 5-9: Position Statistics for Advantage



30% of line management and 20% of engineers in a senior role had this consensus. Christensen (1997) highlighted that the reason why low-end disruptions are hard for incumbent firms to handle is that they usually take place in the lower segment of the market, the established firm's processes and values are not appropriate for pursuing

a low-cost business model, and the cost structure of the established company makes it impossible to develop low-cost products immediately and efficiently.

In terms of understanding the construct of emerging technology, the respondents have an adequate understanding of its effect when new functionality or cheaper products are devised and launched into the market by new entrants or existing incumbents; however when this technology is influenced and combined by virtue of its disruption, then this seems to generate some un-treaded territory of the construct, especially when it is not believed that technology in other industries can affect the telecommunication boundaries and rules. A larger selected sample would prove valuable to illicit responses that provide more evidence in terms of ascertaining whether the amount of awareness and understanding of disruptive technologies exist. In order to increase the reliability of this finding, perhaps a follow-up face-to-face interview will be useful as well.

The responses from the industry players suggest that there may be a small amount of grey area that requires further delving, as their understanding of the construct can only be clarified with further investigation. Therefore, this objective is only partially met within this study.

5.4 The Primary Determinants that Cause the Retention of Old Technology (Objective 2)

The aim of this objective is to identify the factors that cause the reliance by providers on existing technologies.

Figure 5-10: Responses from Employee positions

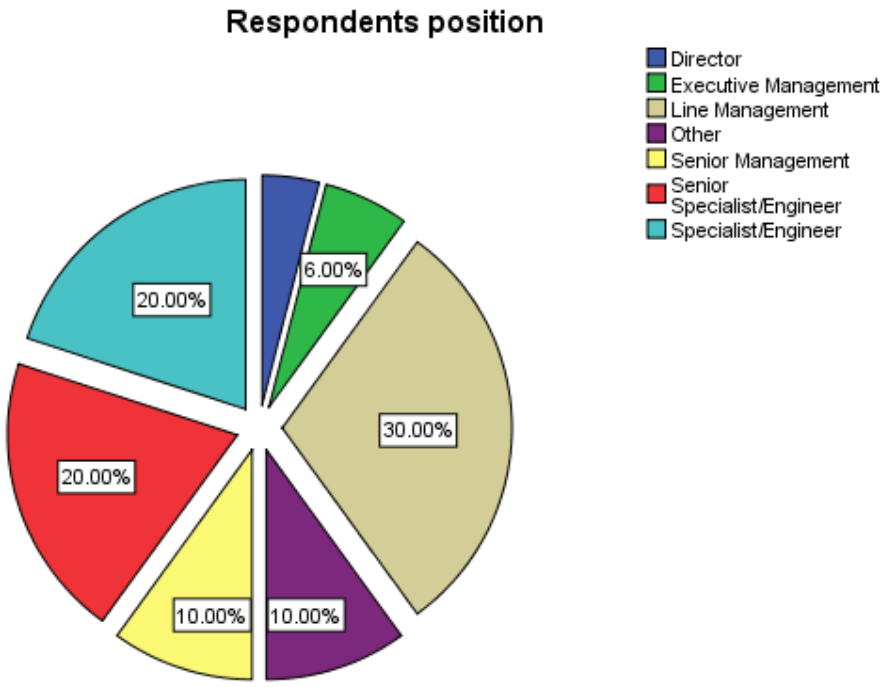


Figure 5-10 represents the distribution of the positions that the respondents occupied within their organisations. The percentage of respondents that participated in this study adds to the validity as there are employees that are closely working with new technologies and managers that are performing decisions that are related to technology. The inclusion of directors has also added to the benefits of ascertaining cultural, leadership and strategic impacts on the selection of emerging technology.

This analysis will be approached by employing a statistical method of an exploratory factor analysis that aims to identify a group of elements that underlie the data and further reduce the set of factors. Factor analysis is a statistical technique used to

identify a smaller number of underlying dimensions, or factors, that can be used to represent relationships among interrelated variables.

Table 5-4: Variable Correlation Matrix

	Strategy Planning	Slow Decision Making	Market Conditions	Structure	Legacy Technology	Degree of Competition	Risk	Culture	Capabilities & Competencies	Knowledge
Strategy Planning	1.000	.422	-.299	-.361	-.240	.013	-.097	.502	.175	.031
Slow Decision Making	.422	1.000	.070	-.566	-.260	-.093	-.225	.227	.088	-.112
Market Conditions	-.299	.070	1.000	.231	.242	-.041	-.133	-.152	.016	.175
Structure	-.361	-.566	.231	1.000	.435	-.031	.161	-.304	-.019	.152
Legacy Technology	-.240	-.260	.242	.435	1.000	.029	.258	-.260	.244	-.092
Degree of Competition	.013	-.093	-.041	-.031	.029	1.000	.215	-.016	.241	-.101
Risk	-.097	-.225	-.133	.161	.258	.215	1.000	-.071	-.026	-.131
Culture	.502	.227	-.152	-.304	-.260	-.016	-.071	1.000	.204	.092
Capabilities & Competencies	.175	.088	.016	-.019	.244	.241	-.026	.204	1.000	.139
Knowledge	.031	-.112	.175	.152	-.092	-.101	-.131	.092	.139	1.000

Table 5-4 represents the correlation matrix between the various factors. The different factors were selected from the literature search that informed the questionnaire .A correlation is a number between -1 and +1 that measures the degree of association between two variables (call them X and Y). A positive value for the correlation implies a positive association (large values of X tend to be associated with large values of Y and small values of X tend to be associated with small values of Y). A negative value for the correlation implies a negative or inverse association (large values of X tend to be associated with small values of Y and vice versa).The variables that are represented in Table 5-4 were proposed as questions to the respondents. The matrix indicates that the factors show a very weak un-correlated association, and this data can be ideally used for an exploratory factor analysis.

Table 5-5: Extraction of Eigen-Values

Component		Initial Eigen values			Extraction Sums of Squared Loadings		
		Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
	1	2.616	26.156	26.156	2.616	26.156	26.156
	2	1.483	14.828	40.984	1.483	14.828	40.984
	3	1.385	13.855	54.839	1.385	13.855	54.839
	4	1.111	11.108	65.947	1.111	11.108	65.947
	5	.898	8.984	74.930			
	6	.741	7.412	82.343			
	7	.612	6.123	88.466			
	8	.522	5.221	93.687			
	9	.362	3.620	97.306			
	10	.269	2.694	100.000			

Extraction Method: Principal Component Analysis.

Principal component analysis (PCA) is a mathematical procedure that converts a set of observations of possibly correlated variables into a set of values of uncorrelated variables called principal components. The number of principal components is less than or equal to the number of original variables. The Eigen-Values are the variances in the factors.

The extracted Eigen-Values show that there are 4 components that have EV (Eigen-Values) >1, This implies that there are 4 underlying factors for this objective.

Table 5.6 below shows the correlation between the 4 reduced components and the proposed 10 factors from the research instrument.

Table 5-6: Relationship between Factors and Extracted Components

	Component			
	1	2	3	4
Strategy Planning	.732	.252	.151	-.141
Slow Decision Making	.690	-.145	.086	.533
Market Conditions	-.342	-.382	.490	.467
Structure	-.773	-.003	.198	-.264
Legacy Technology	-.615	.309	.267	.300
Degree of Competition	-.053	.655	.012	.165
Risk	-.321	.589	-.297	-.104
Culture	.627	.213	.276	-.292
Capabilities & Competencies	.103	.521	.667	.150
Knowledge	-.035	-.254	.628	-.532
Extraction Method: Principal Component Analysis.				

By checking the strong level of correlation between the 4 components, the following is apparent, the underlined elements denotes the highest correlation.

Component 1 [Strategy & Planning, Slow decision Making, Culture]

Component 2 [Degree of Competition & Risk]

Component 3 [Capabilities & Competencies and Knowledge]

Component 4 [Slow Decision Making]

Therefore the primary determinants that are discovered are through careful consideration, combination and evaluation of the relevant literature,

5.4.1 Strategy & Culture

In Chapter 2 it was ascertained that in a high technological driven industry where the rate of emerging technology has the potential to quickly invalidate an organisation's strategic plan, the sequential approach to strategy can be conceived as insufficient. A simultaneous and continuous approach to strategy produces a number of potential benefits. The main benefit is attributed to the fact that there is a definite time-lag

between when an opportunity is identified until it is taken advantage of by the organisation, i.e. time elapses from formulation up until implementation. Therefore if strategy cannot "keep up" with the changes brought by technology, then this impacts the direction and competiveness of the organisation. Therefore if the strategic planning of the organisation does not consider emerging technology, then the organisation will fail to see the real benefit of the transition.

Tushman and O-Reilly (2002) also argued that culture is an effective way of controlling and coordinating people without the need for formal control systems. Christensen & Raynor (2003) and Hendersen (2006) also indicate that when great changes such as disruptive innovation occurs, organisational culture generates cultural inertia which is so difficult to overcome directly that it is a key reason why managers fail to introduce timely and substantial change even when they know that this change is required. The organisation's culture also consists of its leadership type and decision making processes that influence the choice of technology along its lifespan. Bass and Avolio (1994) characterized transformational leadership as being composed of four dimensions: *intellectual stimulation, individualized consideration, individualized influence, and inspirational motivation*. These elements suggest that transformational leadership is positively related to followers' innovation implementation behaviour because it can increase commitment to change.

5.4.2 Nature of Industry

Porter (2008) indicated that industry structure drives competition and that technology and innovation are factors that impact the primary five forces shaping competitive strategies and ultimately industry structures. In Chapter 2 it was discussed that the concentration of operators competing in the South African telecommunications industry is relatively high (i.e. at present, 2 fixed line operator and four mobile operators), and subsequently competition is intense especially in the cellular mobile market. The South African market is also showing signs of saturation, with penetration rates attributed to consumers owning more than one SIM-card in order to access the different bearer services. The providers are also targeting the same market segments and at the moment choose to ignore under-serviced and rural areas. In essence competition is increasing dramatically and profit margins are on its

way down. The various network operators seem to be investing a large amount of resources in order to ascertain the needs of the market in relation to the competition, and therefore consider new technology choices under the needs of the customer. This tends to focus the provider's strategy towards a market pull, which deters the organisation from transitioning to new technologies.

5.4.3 Knowledge and Competence Management

Nonaka and Takeuchi (1995) proposed a theory of Knowledge Creation as the building block for innovation. The creation of knowledge from within the organisation; on the contrary, is deemed to be the cornerstone of innovation and not the reactive processing of information from the external environment. Tang and Yeo (2003) highlight competence barriers are a result of a lack of creativity and new knowledge required for innovation. This lack of the crucial elements that are responsible for proper technology choices places pressure on the organisation to cope with new emerging technologies, and the risk to manage it is perceived by the organisation to be rather high. This has a severe effect on the organisation as it does not have the neccessary skills to manage the new emerging technology and sees the existing types as the safer option.

Tushman and Anderson (1986) also indicated that innovations can be either competence-destroying or competence-enhancing. Competence-destroying innovations are based on different technological knowledge or concepts, which make the firm’s existing skills and knowledge irrelevant. On the other hand, competence-enhancing innovations build on existing know-how, these tend to reinforces the existing order within the industry, while competence-destroying types tend to overturn the existing operations of new firms (Tushman and Anderson, 1986). Therefore the organisation is more comfortable with competence-enhancing technology types instead of facing competence-destroying ones. This poses an issue to the organisation if the new emerging technology has the potency to misalign with its existing competencies, and therefore the organisation decides to "keep away" from this technology that "seems" disruptive and therefore this deterrent has the potential to be absorbed by other organisations that become future major threats in the industry.

5.5 The Early Adoption of Emergent Technology leads to Increased Competiveness (Objective 3)

The aim of this objective was to indicate the relationship between market competiveness and the adoption of emerging technology. The questions that were developed were devised and paired to indicate whether the early adoption of new technology will increase the organisation's competitiveness. In the design of the research instrument the questions were devised in pairs that illicit a response to ascertain the verification of this relationship.

Table 5-7: Descriptive Statistics of paired variables

	Minimum	Maximum	Mean	Std. Deviation
Adoption1	1	4	2.10	.814
Competiveness1	1	3	1.50	.544
Adoption2	1	4	2.88	.659
Competiveness2	1	4	2.30	.814
Adoption3	1	4	2.22	.708
Competiveness3	1	4	1.84	.817
Adoption4	1	3	1.60	.571
Competiveness4	1	4	2.22	.840
Adoption5	1	4	1.96	.570
Competiveness5	1	3	1.76	.555

Standard deviation is a statistical value used to determine how spread out the data in a sample are, and how close individual data points are to the mean, or average, value of the sample. A standard deviation of a data set that is equal to zero indicates that all values in the set are the same. A larger value implies that the individual data points are farther from the average value. As an example the mean for variable Adoption1 is 2.10, this implies that the sample tends to agree that launching a new unique product first in the market will always lead to more success than the competition; a value under 2 will imply that the sample definitely agrees. However, the respondents also felt strongly that to be successful, the organisation has to be actively searching for technological opportunities. There is a difference in the means and Standard Deviations between the pairs in red above. Therefore an analysis of variances will prove helpful.

Table 5-8: Analysis of Variances of paired variables

ANOVA						
		Sum of Squares	DF	Mean Square	F	Sig.
Adoption1	Between Groups	10.267	6	1.711	3.309	.009
	Within Groups	22.233	43	.517		
	Total	32.500	49			
Competiveness1	Between Groups	.800	6	.133	.418	.863
	Within Groups	13.700	43	.319		
	Total	14.500	49			
Adoption2	Between Groups	3.480	6	.580	1.401	.236
	Within Groups	17.800	43	.414		
	Total	21.280	49			
Competiveness2	Between Groups	4.200	6	.700	1.064	.399
	Within Groups	28.300	43	.658		
	Total	32.500	49			
Adoption3	Between Groups	2.047	6	.341	.651	.689
	Within Groups	22.533	43	.524		
	Total	24.580	49			
Competiveness3	Between Groups	3.853	6	.642	.957	.466
	Within Groups	28.867	43	.671		
	Total	32.720	49			
Adoption4	Between Groups	3.100	6	.517	1.722	.139
	Within Groups	12.900	43	.300		
	Total	16.000	49			
Competiveness4	Between Groups	2.880	6	.480	.651	.689
	Within Groups	31.700	43	.737		
	Total	34.580	49			
Adoption5	Between Groups	2.053	6	.342	1.061	.400
	Within Groups	13.867	43	.322		
	Total	15.920	49			
Competiveness5	Between Groups	.520	6	.087	.255	.954
	Within Groups	14.600	43	.340		
	Total	15.120	49			

By checking the significance ($p<0.05$) in the analysis of Variance Table (ANOVA), the variable adoption1 indicates that there is a significant different view amongst the various employee levels in their respective companies with regards to launching a

new unique product first in the market. The aspect that was being verified here was to gather information where respondents believed that being first to market will always lead to future success. The responses were relatively diverse as highlighted in the ANOVA table. Kotler (1999) indicated that an organisation has 3 choices to commercialise a product, however being the first mover or follower remains a contentious issue. The 3 choices are,

1) First Entry – The first firm entering the market usually enjoys the 'first-mover-advantages' of locking in key distributors and customers and gaining reputational leadership. But if the product is rushed to market before it is thoroughly tested, the product can acquire a flawed image.
2) Parallel entry – The firm might time its entry to coincide with the competitors' entry. The market may pay more attention when 2 companies are advertising the same product.
3) Late Entry – The firm might delay the launch until after the competitor has entered. The competitor would have incurred the cost of educating the market. The competitor's product may reveal faults that the entrant can avoid. The company may also be in a better position to assess the size of the market.

Table 5-9 below indicates the paired-sample correlations of responses

Table 5-9: Pearson's Correlations of paired variables

		N	Correlation	Sig.
Pair 1	Adoption1 & Competiveness1	50	.299	.035
Pair 2	Adoption2 & Competiveness2	50	-.236	.099
Pair 3	Adoption3 & Competiveness3	50	-.008	.953
Pair 4	Adoption4 & Competiveness4	50	.272	.056
Pair 5	Adoption5 & Competiveness5	50	.291	.040

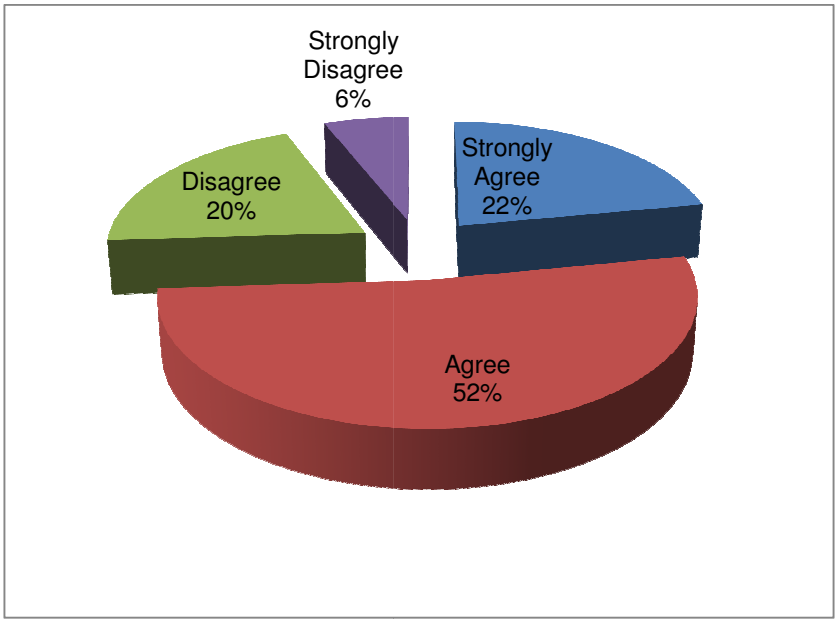
According to Porter (2008) first movers have no guarantee of success. Porter (2008) also outlines some critical success factors that are associated with first mover

advantages and disadvantages. The advantages include reputation, pre-empting an attractive market position, creating switching costs, assessing distribution channels first, locking in key suppliers, defining industry standards and establishing barriers. First mover disadvantages include pioneering costs, uncertain demand, coping with changing customer needs, irreversible capital investments, the effects of technological discontinuities and the appearance of substitute products.

Table 5-10: Descriptive Statistics for First Mover Advantages

	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Strongly Agree	11	22.0	22.0	22.0
Agree	26	52.0	52.0	74.0
Disagree	10	20.0	20.0	94.0
Strongly Disagree	3	6.0	6.0	100.0
Total	50	100.0	100.0	

Figure 5-11: Graphical Representation For First Mover Advantages



There is a 68% disagreement in that new technology that initially does not generate sales will be discontinued immediately; however 74% (Table 5-10) agree that it will be an added advantage to be first in the market. In terms of competiveness, this implies that the organisation is seemingly willing to incur the cost of support and

maintenance over a period of infancy of a new product or service, and will potentially develop other new services on technologies that are not necessarily profitable to the organisation.

Table 5-9 indicates under the considerations of ANOVA (Table 5-8), that there are no pairs that are relatively closely correlated .This means that there is no linear dependence between the early adoption of emerging technology and competiveness, i.e. there is not any real evidence to suggest that the early adoption of new technology will lead to increased market competiveness in this industry, even though it is perceived that being first to market with a product can lead to competiveness.

5.6 Summary

In this chapter the findings of the study were presented. The results of the quantitative data analyses were gathered from the survey questionnaires that were circulated to the various employees in the telecommunication industry.
The surveys content was analysed to assist with reaching the research objectives. These questions and responses were grouped together and presented in three categorical groups which assisted in making inferences about the population through the sample chosen.

Chapter 6 - Conclusions and Recommendations

6.1 Introduction

The purpose of this study was to demonstrate that organisations develop an over-reliance on proven technology in the telecommunication industry, through 3 objectives. This problem was unravelled in 3 stages. **1st**, the theoretical considerations (Chapter 2) and literature search (Chapter 3) were examined for further insight into the related themes of Strategy, Innovation, Technology and the reshaping of the telecommunications industry. **2nd**, respondents were surveyed from the various industry incumbents. The survey was devised from the input provided by Chapter 2 & Chapter 3.**3rd**, the collected data was analysed quantitatively in order to draw certain attributes from the sample that brings the researcher closer to uncovering the complexity of the problem area.

6.2 The Research Design

The nature of this study follows an exploratory approach; however the research method applied is of a quantitative type that assesses the objectives and problem statement on a statistical level. Added value to the study could have been provided by following up the quantitative approach with a combination of some qualitative analysis, especially to ascertain the level of awareness of disruptive innovative in the industry.

The researcher is adequately satisfied that the sample chosen for the study was sufficient enough to retrieve valid and reliable information, however a larger sample could have been used to increase the validity of the findings for one of the objectives.

There were some challenges in devising clear and concise questions in the research instrument (questionnaire). The issue is that the questionnaire was circulated throughout the industry and within different divisions within each organisation, which prompted the researcher to simplify questions such that the understanding of each

was less complex. At times, this simplification made it difficult to devise questions of a deeply seated technical aspect.

6.3 Accomplishment of the Research Objectives

The understanding and awareness of disruptive innovation and the impact of emerging technology as a construct can, on one hand indicate that the industry players are preparing adequately to face the new technological wave, however on the other, respondents displayed doubt in terms of technology that is surfacing across industries. This aspect may not necessarily impact the source industry but has a dramatic impact on the other adopting ones. In other words, the industry seems a bit perplexed as to the shapers and adopters in the telecommunication industry. With the convergence of the IT and Telecommunications industries, a mixed mindset seems to surface that influences the different technology choices from the different employee viewpoints, the convergence has arguably also created some confusion in the market place. One such example is the origination of cloud computing that brings hosted email and other corporate communications to the forefront, meaning that corporate firms may start utilising Google Gmail instead of the business services offered by the various telecommunications providers. The concept of disruptive innovation is also viewed by the industry as an externally driven force that needs to be assessed as part of the strategic planning of the organisation, therefore the concept of dualism (planning for operations & Strategy on a Daily-basis) as an element of competiveness cannot be underestimated by industry occupants. The assessment of the primary determinants that prevent an organisation from transitioning to new emerging technologies has demonstrated that even though disruption originates externally, it is predominantly the internal organisational elements that allow it to become disruptive. The cultural and strategic rigidities that arguably prove challenging to change were also evident in the findings. The transitioning to new technology is not about utilising new I.T systems, but changing the thinking, values, strategy & learning behaviour within the organisation. The results prompt for a different method of strategic implementation and evaluation when it comes to technology choices, as managing change touches the entire organisation in these recent times.

The external market conditions also have an impact on the strategy in terms of a market pull or technology push, when new technology surfaces, which also now involves a continuous re-evaluation of strategic activities. However, the findings denote that the early adoption of disruptive technology is not perceived to bring an enormous amount of revenue or increased competiveness, as the market may not require the additional functionality and benefit.

In essence there is a fine line between the added risks of adopting disruptive technologies in its infancy, as it may open up new growth paths, but may also serve to increase the organisations exposure in potentially wasting resources or not dealing successfully with continuous change.

6.4 Conclusion

With the continuing advancement of IP broadband access technologies, basic voice and messaging services are increasingly under threat of becoming a commodity. To reduce the loss of revenue and to face new competition from Internet service providers network operators are reacting by delivering new and innovative, feature-rich communication and content-based services. End-user service personalization and short time-to-market are crucial characteristics for operators to succeed as value-added service providers.

In terms of the problem statement, the findings indicate that **there is an over-reliance** on proven technology in the SA telecommunication industry. This dependency originates through/from,

- A **seemingly** lack of awareness or misunderstanding of the construct of disruptive innovation within the industry.
- The Cultural & Strategic inertia that an organisation develops over time acts as a barrier to new technological transitioning.
- The insufficient management of knowledge and competencies to adequately align successfully with this disruption, and
- The external market conditions, that sometimes dictate the specific type of products that will be required by customer, which implies that newly adopted

technology, **will not** always generate increased competiveness by flooding the segments with very new products and services.

6.5 Recommendations

Handy (2002) indicated that organisations need to build parallel structures and activities that would permit the forces of today and tomorrow to co-exist, that is processes that allow dualism. The two forces are known as upstream and downstream types. Downstream types are focussed with technical support for problems with the current products and in addition getting new products into the marketplace. Upstream forces are concerned with all the possible core technologies that act as future product enablers. A multitude of stakeholders that are involved in the process of innovation, idea generation and successful product introduction need to be separated as being primary or secondary as related to the change that technology disruption brings. A different stakeholder management strategy needs to be adopted for each stakeholder group such that attention can be applied to areas that are really impacted. Usually there are numerous debates between the development and system operations teams as new technologies, on one hand are seen as disruptors to the "status quo" and, on the other, seen as organisational growth to the development team. Therefore technology choices have to be collectively collaborated between all the different teams that are involved in product delivery, it should not be a sole responsibility of the Engineering divisions. In essence this implies that when new technology surfaces, then there is a willingness to accept and explore it collectively across the organisation, which will also assist in creating a culture of innovation.

Christensen and Raynor (2003) noted that the reason why incumbents face the problem of ignoring disruptive innovations lies in the *processes* and *values* of the firm. The processes are the patterns of interaction, coordination, communication and decision-making through which companies transform resources into products and services. According to Christensen (1997), the most crucial processes are the processes that support investment decisions, e.g. market research and processes for financial projections. More importantly, these processes and values must have a large degree of flexibility if the organisation is willing to embrace technological

change. In Chapter 2, flexibility was indicated to be a managerial task, i.e. can managers respond at the right time in the right way? It is therefore imperative for the organisation to develop the managerial capabilities that promote the firm with flexibility. This can be attained through the creation of enough flexibility options and a mix of flexibility-increasing procedures so that the organisation is capable of dealing with disruptive issues in a timely and effective manner. Therefore management should pay special attention and react to information in the telecommunications industry and other technological driven sectors simultaneously, if further industry competiveness is to be attained. There needs to be a concise plan of disseminating new knowledge and information across the organisation such that all teams are aware of the rising uses, implications and advantages thereof. This added collaboration will also assist in developing future competencies and break-down the sometimes "silo" nature of operation.

In current times, the regulatory body (ICASA) is playing a major role in shaping the telecommunication industry; further study can be beneficial to exploit its relationship to disruptive innovation and the way that it is shaping the strategic innovation paths of the current incumbents. Further research may provide a better understanding as to what encourages or impedes innovation and thereby improve South Africa's ability to compete more effectively in international markets for the purpose of stimulating economic growth.

In this study the prime theme that has also surfaced is the concern around the organisation's business models and the way that disruptive innovative seems to "attack" them. This is demonstrated by the fact that incumbents cannot adjust their models to suit the new market segments that disruption brings. Therefore it would prove valuable to uncover the complexities with regard to this area, specifically, how organisations are able to build flexibility in their models when disruption emanates in the industry.

A more dedicated study between a new entrant and an established incumbent can also be performed to gather the different perspectives into how these 2 different organisations manage disruption and technology choices, the differences/similarities can then be used to actively predict their impacts on the market.

References

Amabile, T.M. (1998). 'A model of creativity and innovation in organisations', *Research in organisational Behaviour*,10(1):123-167.

Argyris, C. ,Schoon, D. (1996). *Organisational Learning 11 : Theory, Method and Practice*. Reading MA: Addison-Wesley.

Baker, W.E. and Sinkula, J.M. (2002). 'Market orientation, learning orientation and product innovation: delving into the organization's Black Box', *Journal of Market-focused Management*, 5(1): 5-23.

Bass, B.M. (1990). 'Bass and Stogbill Handbook of Leadership'. *Free Press*. New York.

Bass, B. & Avolio, B.(1994). *Improving organizational effectiveness through transformational leadership*. Thousands Oaks. CA. Sage Publications

Botha, D.F. (2000). 'A conceptual framework for the management of knowledge in a knowledge-based enterprise', *South African Journal of Business Management*, 31(4).

Botha. D.F. and Fouche, B.(2002). 'Knowledge management practices in the South African business sector: preliminary findings of a longitudinal study', *South African Journal of Business Management*,33(2).

Botha, D.F. (2004). 'Towards an instrument for surveying knowledge management practices', *South African Journal of Business Management*, 36(1).

Brown, J.S. (1998), 'Seeing differently: a role for pioneering research', *Research Technology Management*, 41(3): 24-33.

Burns, T. and Stalker, G. M. (1961).*The management of Innovation.* London: Travistock Publications.

Carneiro, A. 2000. 'How does knowledge management influence innovation and competitiveness?', *Journal of Knowledge Management*, 4(2): 87.

Charlesworth, J., Lawton, A., Lewis, J., Martin, V. & Taylor P. (2001). *Toolkit 1*: *Study Guide for MBA B736*.Milton-Keynes: Open University.

Charlesworth, J., Lawton, A., Lewis, J., Martin, V. & Taylor P. (2001). *Toolkit 2*: *Study Guide for MBA B736*.Milton-Keynes: Open University.

Chesbrough, H. (1999).' The organisational impact of technological change: A comparative theory of national institutional factors'. *Industrial and Corporate change,* 8 (3): 447-485.

Christensen, C. (1997). 'The innovator's Dilemma'. Boston: *Harvard Business School Press*. Boston.

Christensen, C.M. (2003). 'The Innovator's Dilemma'. *Harper Business Essentials*. New York: NJ.

Christensen C., Raynor M. E. (2003).'*The* Innovator's Solution. Creating and Sustaining Successful Growth', *Harvard Business School Press*. Boston.

Coldwell, D & Herbst, F.J. (2004).*Business Research*. South Africa: Juta & Co Ltd

Cooper, A.C. and Smith, C.G (1992).*How established firms respond to threatening technologies*. New York: Oxford University Press.

Damanpour, F. (1991). 'Organizational innovation: A meta-analysis of effects of determinants and moderators'. *Academy of Management Journal, 34*(3): 580.

Deloitte Research. (2004). Mastering Innovation: Exploiting Ideas for Profitable Growth, Research Report.

Drazin, R. & Schoonhoven, C. (1996). 'Community, population, and organisational effects on innovation: A multilevel perspective', *Academy of Management Journal,* 39 (5): 1065-1083.

Dyerson, R. and Pilkington, A. (2005). 'Gales of Creative Destruction and the Opportunistic Incumbent', *Technology Analysis and Strategic Management*, 17(4):391-408.

Farson, R. and Keyes, R. (2002).' The Failure-Tolerant Leader', *Harvard Business Review*, Boston: Harvard Business School Press.

Freeman, C. (1994). 'The economics of technical change', *Cambridge Journal of Economics,* 18: 463-514.

Frost , P. & Egri, C. (1991). 'The Political process of innovation', *Research in Organisational Behaviour*, 13: 229-295.

Gartner.(2005). *What Convergence and Substitution Mean for Telecom Companies*. Available from: <http://www.gartner.com>. [Accessed 26 Jan 2011].

Gartner.(2008). *Hype Cycle for Wireless Networking Infrastructure*. Available from: <http://www.gartner.com>. [Accessed 26 Jan 2011].

Gemuenden, H. (1988). 'Promoters: Key persons for the development and marketing of innovative industrial products'. In: K. Gronhaug & G Kaufmann. Eds. 'Innovation: A Cross-Disciplinary Perspective' .Oslo: *Norwegian University Press*. 347-374.

Goleman, D. (2000). 'What makes a leader'. *Harvard Business Review,* 65: 67-69.

Grant, R.M. (1998). *Contemporary Strategy Analysis*.3rd ed. Oxford: Blackwell.

Grant, R.M. 1996. 'Toward a knowledge-based theory of the firm'. *Strategic Management Journal*.17(3).

Grinyer, P. and McKiernan, P. (1994). 'Sharp-benders revisited'. *British Academy of Management Journal*.

Handy, C. (2002).*The elephant and the flea*. Boston: Harvard Business School Press.

Hauschildt, J. (2003). 'TeamWork for innovation – The Troika of Promoters', *R&D Management,* 31 (1): 41-49.

Hendry, J. (1989). 'Technology, marketing, and culture: The politics of new product development'. In: R. Mansfield. Eds. *Frontiers of Management*. London: Routledge.96-108

Howell JM, Higgins CA. 'Champions of technological innovation'. *Administrative Science Quarterly* (35).

Informa.(2011). *Informa*. Available from: <http://www.informa.com>. [Accessed 15 Jan 2011].

Johnson, B., Jensen, M.B., Lorenz, E and Lundvall, B. (2007). Forms of Knowledge and mode of innovation. *Research Policy*. (36):680.

Jones, R. (2005). So what is Flexibility? Toward a multi-level theory of organisational group, and individual flexibility. Honours Thesis. Queensland University of Technology.

Jorde, T. and Teece, D. (1990). 'Innovation and Cooperation: Implications for competition and antitrust', *Journal of Economic Perspectives,* 4 (3):75-96.

Keller RT.(1992). 'Transformational leadership and the performance of research and development project groups'. *Journal of Management* 18(3):501.

King, N. (1990). 'Innovation at work: The research Literature'. In: M. West & J. Farr. Eds. *Innovation and Creativity at work*. U.K.: John Wiley. 15-59.

Kline, S. J. And Rosenberg, N. (1986).'An overview of innovation'. In: R. Landua and N. Rosenberg. Eds. *The Positive Sum Strategy* .Washington: National Academy Press. 275-305.

Kotler, P. (1999). 'Kotler on Marketing: How to create, win and dominate markets'. New York: *The Free Press*.

Langlois, R.N, and Robertson, P.L (1995).*Firms, markets and economic change: A dynamic theory of business institutions*. London: Routledge.

Langlois, R. N. (1997). 'Cognition and Capabilities: Opportunities seized and missed in the computer industry'. New York: *Cambridge University Press*.

Leedy, P and Ormond, J. (2005).*Practical Research*. New Jersey: Prentice Hall.

Leonard-Barton, D. (1995). 'Wellsprings of knowledge: Building and sustaining the sources of innovation'. Boston: *Harvard Business School Press*.

Levitt, T. (1980).'Marketing success through the differentiation of anything', *Harvard Business Review,* 58: 56-66.

Lynn, G. S., Morone, J. G. & Paulson, A. S. (1997). 'Marketing and discontinuous Innovation: The probe and learn process'. In : M. L. Tushman& P. Anderson. Eds. *Managing Strategic Innovation and change, A Collection of Readings*. New York: Oxford University Press. 353-375

Markham, S. and Aiman-Smith, L. (2001). 'Product champions: Truths, myths, and management', *Research-Technology Management,* 9(1): 44-50.

Mitchell, W. (1989).'Whether and when? Probability and timing of incumbents' entry into emerging industrial subfields'. *Administrative science quarterly*. 34(2):208-210.

Moncrieff, J. (1999). 'Is strategy making a difference?' *Long Range Planning Review*, 32(2): 273-276.

Morone, J. (1993). 'Winning in high-tech markets'. Boston: *Harvard Business School Press.*

Nelson, R.R. and Winter, S.G (1994). 'In search of more useful theory of innovation'. *Research Policy*, 5(1): 36.

Nelson, R.R. (2003). The market economy, and the scientific commons. *Research Policy*. (33):458.

Nonaka, I. and Takeuchi H.(1995). *'The Knowledge-Creating Company'*. New York: *Oxford University Press*

Nortel.(2010). *Nortel –online].UK: International*. Available from: <http://www.Nortel.com [Accessed 20 Jan 2011].

Oldham G.R & Cummings A. (1996) 'Employee creativity: personal and contextual factors at work'. *Academy of Management Journal* 39(3):604.

Oppenheim, A.N. (1992). *Questionnaire design, interviewing and attitude measurement*. London: Pinter Publishers.

Piatier, A. (1984). *Barriers to innovation.* London: Frances Pinter Publishers Ltd.

Pavitt, K. (2000). *Technology, management and systems of innovation*. London: Edward Elgar.

Peteraf, M. A. (1993). 'The cornerstones of competitive advantage: A resource based view'. *Strategic Management Journal,* 14: 179-191.

Porter, M.E. (1985). 'Competitive Advantage: Creating and Sustaining Superior Performance'. New York: *The Free Press*.

Porter, M.E.(2008). The Five Competitive Forces That Shape Strategy. *Harvard Business Review*.

Preissl, B. (1998). Barriers to innovation in services.MBA Thesis. University of SI4S.

Roberts, E. (1990). 'Entrepreneurs in High Tech'. New York: *Oxford University Press*.

Rogers, E. (1998). 'The diffusion of Innovation'. New York: *Free Press*.

Saunders, W.B. (2000). 'Interpreting Laboratory Data'. Philadelphia: *Academic Press.*

Schein, E. (1992). *Organisational Culture and Leadership*. New York: Jossey-Bass.

Schoemaker, P. and Marais, L. (1996). Technological innovation and firm inertia. In: G. Dosi & F. Malerba .Eds. *Organisational and Strategy in the Evolution of the Enterprise*. U.K.: MacMillan Press Ltd.179-205.

Schumpeter, J.A. (1942). *Capitalism, Socialism and Democracy*. New York: Harper and Brothers.

Senge, P.M. 2004. 'Creating Communities', *Executive Excellence*, 21(9).

Senge, P.M., Roberts, C., Ross, R.B., Smith, B.J. and Kleiner, A. (1994).*The Fifth Discipline Fieldbook, Strategies and Tools for Building a Learning Organisation*. London: NB Publishing.

Sinkula, J.M. (2002), 'Market-based success, organizational routines, and unlearning'. *The Journal of Business & Industrial Marketing,* 17(4): 253-69.

Smith, A. (1776). *The wealth of nations*. New York. Modern Library.

Storey, J. (2000). 'The management of innovation problem', *International Journal of Innovation Management,* 4 (3): 347-369.

Staudt, E. (1994). 'Innovation barriers on the way from the planned to the market economy: The management of non-routine processes', *International Journal of Technology Management,* 9 (8): 799-817.

Sull,D.(2006). 'Why Good Companies Go Bad'. *Harvard Business Review*. 77(1).

Tan, S. & Henten, A. (2006). 'New Mobile Technologies: Sustaining or Disruptive?'.*Proceedings of the International Conference on Mobile Business (ICMB'06) IEEEComputer Society*.

Tang, H. K. & Yeo, K. T. (2003). 'Innovation under constraints: The case of Singapore'. In: L. V. Shavinina .Ed. *International Handbook of Innovation.* Oxford: Elsevier Science.

Teece, D. (1986). 'Profiting from technological innovation', *Research Policy,* 15: 285-306.

Teece,D.J., Pisano, G. and Shuen.(1990). *Firm Capabilities, resources and the concept of strategy*. Working Paper: University of Califonia.

Tidd, J, 2001. *Managing Innovation*. U.K.: John Wiley.

Tidd, J. ,Bessant, J. &Pavitt, K. (1997). *Managing innovation.* U.K.: John Wiley.

Tidd J., Bessant J., Pavitt K. (2005).*Managing Innovation: Integrating Technological, Market, and Organizational Change*,.ThirdEdition.UK:John Wiley & Sons.

Utterback J. M., Acee H. J. (2005).Disruptive Technologies: An Expanded View, *International Journal of Innovation Management*.

Louw, L., Venter, P. (2006) 'Strategic management: winning in the South African Context'. Cape Town: *Oxford University Press* Southern Africa.

Wilson, D., Hickson, D.J. and Miller, S.J.(1999). *Decision overreach as a reason for failure: How organisations can overbalance*. USA:Sage Publications.

Wilson, D.C. and Rosenfeld, R.H. (1990).*Managing Organisations: Text, Readings and cases*.UK:McGraw-Hill

Wind, Y. and Crook, C. (2005).*The Power of Impossible Thinking*. NJ: Wharton School Publishing.

Wirtz, B.W., 2001. 'Reconfiguration of Value Chains in Converging Media and Communications Markets'. *Long Range Planning*. 34 (1): 77

Appendix

1. Email to Respondents

Dear Sir/Madam

I am currently completing a research report that I need to present to the Graduate School of Business Leadership (SBL) University of South Africa (UNISA), in partial fulfilment of the requirements for a Masters' degree in Business Administration (MBA). This section of the course involves the gathering of some data and information from the various employees within the SA Telecommunications Industry. I understand that time is precious, but will really appreciate your participation.
The questionnaire requires approximately 4-6 minutes for completion. Please answer all the questions of the questionnaire otherwise I will be unable to use your input.

The survey is very confidential and it will not be possible to identify who supplied the answers to the questionnaire. All questions pertain to the South African Mobile Telecommunications Industry.

Please click on the link below and you will go directly to the survey web page.

https://www.surveymonkey.com/s/disruptive_technologies

If that does not work then please copy and paste the link above into your web browser's address input field and press the 'Enter' key or click on the 'Go' button.

The Academic & Business area of focus in this study is centralised on "Innovation", specifically innovative factors that influence the market place and drives change in strategies and flexibility within established industry incumbents. The relevance of the subject area has been attributed to the nature & rate of emerging technologies and an organisation's dependence on old/proven/working types. This legacy technological over-reliance provides the current operable stability, but it also raises a serious argument in that it adds boundaries for future industry competiveness.

If you wish to view the results of this research activity, please contact me via email:
72087013@mylife.unisa.ac.za

Regards
Sathveer.

2. Questionnaire Outline(To be Submitted Online)

Questions

Rating scale of 4 - Strongly Agree=1, Agree=2, Disagree=3, Strongly Disagree=4

Questions for Objective 1

1. One of the biggest fears of emerging technology is the replacement of existing products that are based on old technology.
2. New technology is not used immediately because it is initially very expensive.
3. New Technology is initially only introduced by new industry entrants.
4. New industry entrants are able to create a new market segment because they have the latest technology.
5. New industry entrants are able to sell their products to existing customers because they are cheaper.
6. New industry entrants are able to sell their products to existing customers because they offer new functionality.
7. Established organisations have an unfair advantage as compared to new entrants when new technology surfaces in the industry
8. New technology that emerges in another industry cannot be used in the SA telecommunications sector.
9. The biggest technological threats in this industry are the small start-up firms with new innovative ideas.
10. The entire organisation (All divisions/Groups/Teams) is impacted by the emergence of new technology.

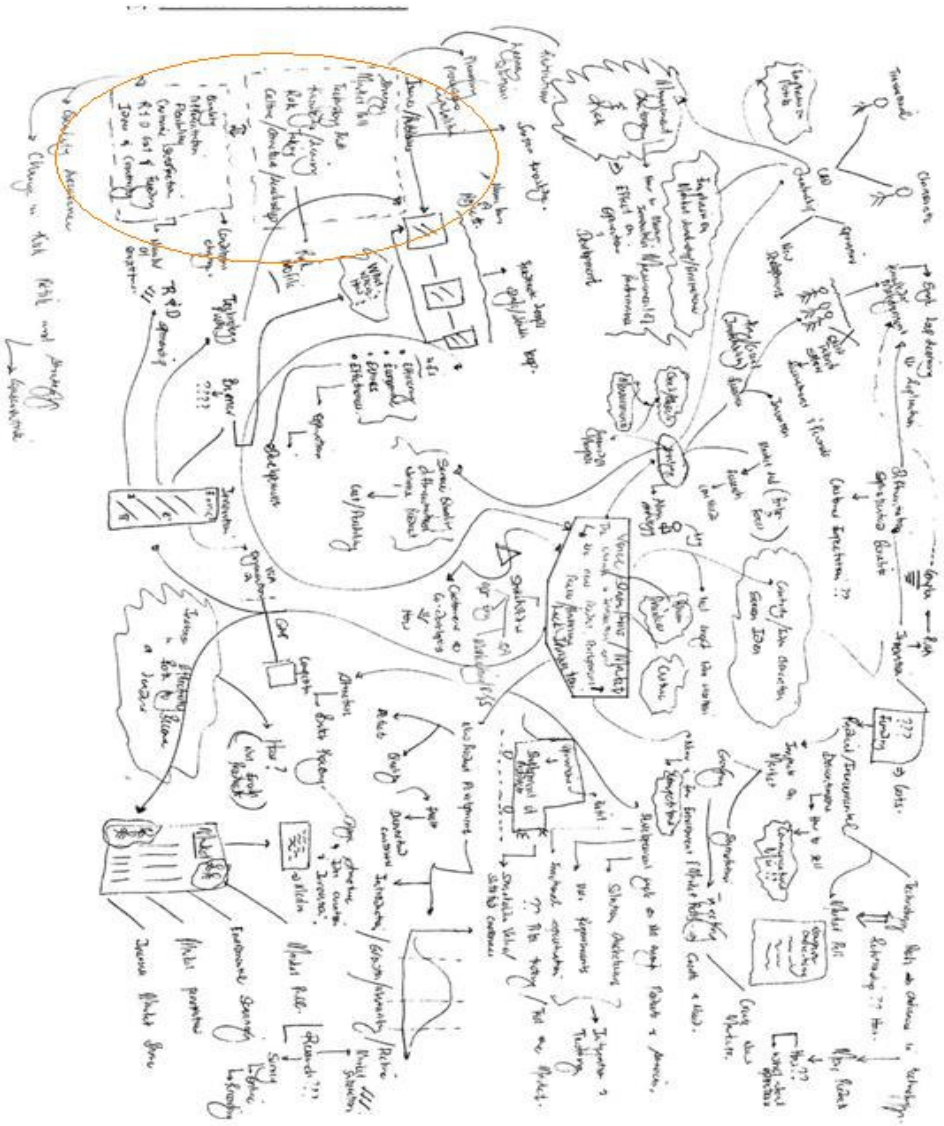
Questions for Objective 2

1. Fairly new knowledge is required to develop other new products that are produced from new technology.
2. The combined skills and expertise of the entire organisation is always required to devise new products that are based on new technology
3. If existing technology is working well in your organisation, and a new type surfaces, Will the new technology be supported by senior management for immediate use.
4. Free new technology is not used by your organisation because senior management believe that it is too risky.
5. If expensive new technology has been introduced by a competitor, which has reduced your organisations market share, your organisation will respond immediately because of a senior management decision.
6. New Technology is not predominantly used by your organisation because there are many products that depend on the old technology type.
7. The introduction of new technology in your organisation occurs slowly.
8. New Technology is not predominantly used by your organisation because the customer will not buy any new products that are based on it.
9. The making of decisions in your organisation happens quickly.
10. The planning for your organisation's future always considers the possible emergence of new technology.

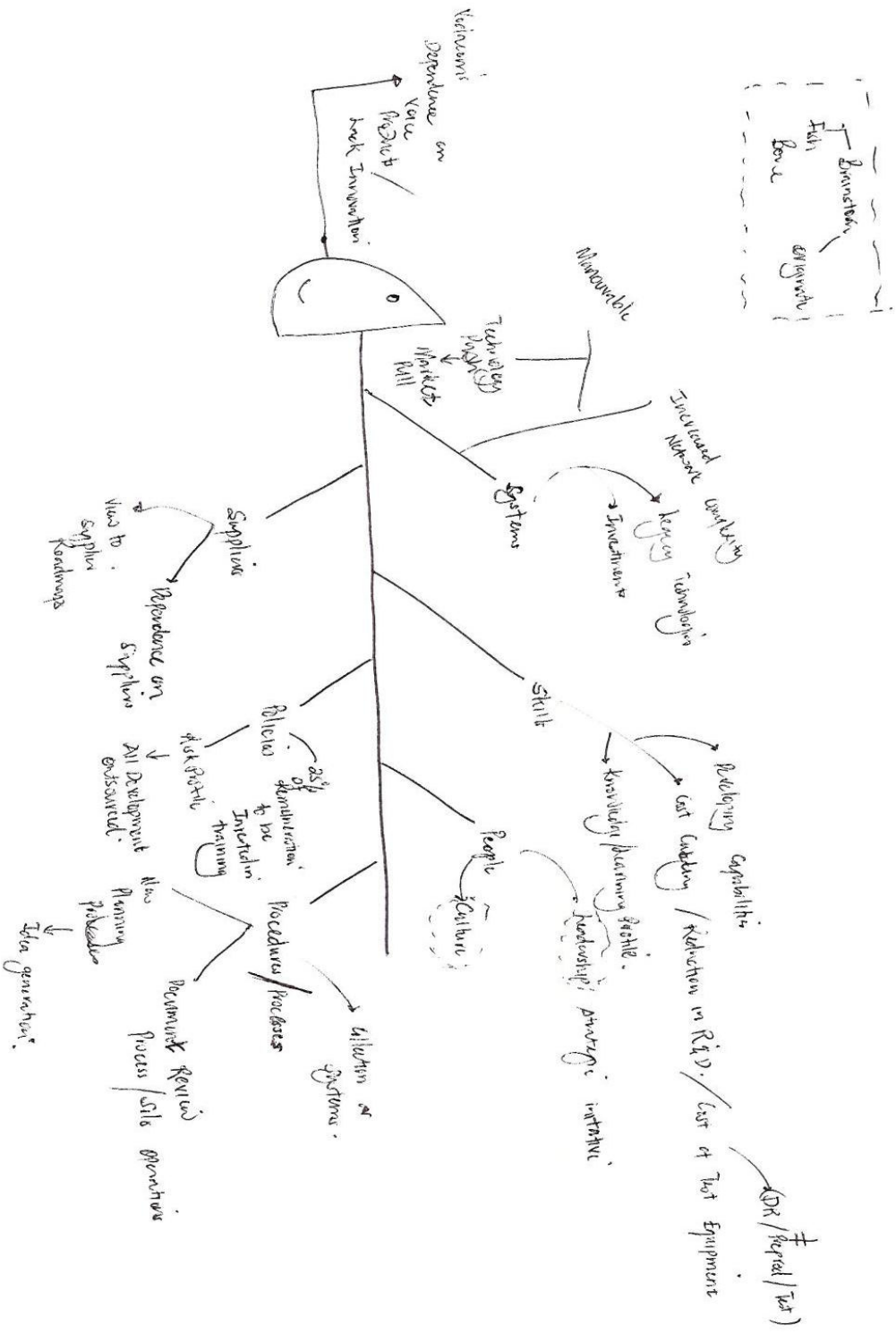
Questions for Objective 3

1. Launching a new unique product first in the market will always lead to more success than the competition.
2. To be successful in this industry an organisation has to be actively searching for new technological opportunities.
3. New technology that initially does not generate enough sales will be discontinued immediately.
4. One of the reasons for the difference in market share is related to the variety of different products offered by the different providers.
5. The current success of your organisation is due to the fact that a number of new technologies have allowed the launching of new products over the last 2 years.
6. Organisational Change is always important to remain successful.
7. The ideal timing of a new product launch into the market is always important for success.

8. To be successful in this industry, your products need to be cheaper than that of the competitors.
9. The introduction of a product that is similar to the competitors can also produce enough sales.
10. The various competitors have different strategies that lead to different market shares.



Appendix 3 : Brainstorm



Appendix 4: Fishbone